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A CONTINUING BIBLIOGRAPHY WITH INDEXES

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7011 (18)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during November, 1965

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. **DECEMBER 1965**

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Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics (AIAA), and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

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methods. It can be employed to detect pregnancy at 8 to 10 weeks, to reveal liver inflammations and brain tumors, and has been used to good advantage in diagnosing diseases of the eyeball, gall bladder, spleen, bladder, uterus, ovary, and in the detection of chest and abdominal fluids. J.M.D.

N65-32652 Joint Publications Research Service, Washington, D. C.

RESEARCH ON THE ROTARY RESONANCE ON ANTI-RADIATION SULPHIDE ELECTRONS

Wen-chuan Hsin, Min-jen Yao, Cheng-lien Chang, and Ch'ing-hsin Hua *In its* Transl. on Communist China's Sci. and Tech., No. 203 9 Aug. 1965 p 81-87 refs (See N65-32650 21-34) CFSTI: $5.00

Experimental results are presented for the effect of ionized radiation on rotary resonance wave spectra of electrons and the radiation protective mechanism of cysteine and other compounds. Mixtures of dry-powder sulfide with (1) amino acid and (2) protein were dissolved in distilled water with the air removed, and vacuum dried at about 15° C to form molecular mixtures. A mixture containing gamma rays of Co^{60} was bombarded at a rate of 260 to 270 roentgens per second; total dosage for the amino acid mixture was 10^6R, for the protein 10^7R. The effect of alanine and cysteine on wave spectra of stomach protease and histidine are recorded for both molecular and physical mixtures. Similar recordings are given for the effect of cysteine on wave spectra of ku-kuang-kan-tan, which is designated as "reducing type" and discussed under the heading of hydroxy chemicals. Results indicate that molecular mixtures of hydroxy compounds offer protection to the free radicals of proteins and amino acids; derived oxides and compounds without sulfur do not exhibit the same effects. M.W.R.

N65-32658# Joint Publications Research Service, Washington, D. C.

CURRENT SOVIET STUDIES ON BIOPHYSICS

28 Jul. 1965 58 p refs Transl. into ENGLISH of 6 Articles from Biofizika (Moscow), v. 10, no. 2, 1965 p 236-245, 272-296

(JPRS-31282; TT-65-31779) CFSTI: $3.00

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3. CHANGES IN ELECTRIC CHARACTERISTICS OF GIANT NEURON MEMBRANE DURING THE INCREASE OF OUTER CONCENTRATION OF POTASSIUM IONS V. D. Gerasimov, P. G. Kostyuk, and V. A. Mayskiy p 17-30 refs (See N65-32661 21-04)

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6. THE EFFECT OF A CONSTANT MAGNETIC FIELD ON PARAMECIUM MOVEMENT A. B. Kogan and N. A. Tikhonova p 48-55 refs (See N65-32664 21-04)

N65-32659 Joint Publications Research Service, Washington, D. C.

SOME KINETIC REGULARITIES OF THE PROCESS OF ELECTRON TRANSFER DURING PHOTOSYNTHESIS

A. B. Rubin and A. S. Fokht *In its* Current Soviet Studies in Biophys. 28 Jul. 1965 p 1-10 refs (See N65-32658 21-04) CFSTI: $3.00

Reported is a study designed to determine the general behavior of the complex system of reactions involved in the sequential transport of electrons during photosynthesis. Proposed and analyzed are a system of nonlinear differential equations which describe schema of the oxidation-reduction transformations of matter in certain initial photosynthesis reactions. On the basis of derived equations the existence of a stable singular point (the stable node) on the phase plane of concentration variation was proven. Using the isocline method, the integral curves appearing at this singular point were constructed. The stationary state for a specific case was calculated and results verified the validity of the proposed scheme. S.C.W.

N65-32660 Joint Publications Research Service, Washington, D. C.

CHANGES IN FLUORESCENCE DURING THE MEASUREMENT OF DIFFERENTIAL SPECTRA OF GREEN PHOTOSYNTHESIZING BACTERIA

N. V. Karapetyan and A. A. Krasnovskiy *In its* Current Soviet Studies in Biophys. 28 Jul. 1965 p 11-16 refs (See N65-32658 21-04) CFSTI: $3.00

Differential spectra of the green bacteria *Chloropseudomonas ethylicum* were studied in the red region of the spectrum in an effort to detect bacterioviridine conversions during photosynthesis and to determine the nature of these conversions. Differential spectrophotometric techniques were used which permitted the measurement and recording of absorption to 0.1% taking place in a time of the order of 0.01 sec. Spectral curves of fluorescence variation excited by the measuring ray under intense light pulses, measured with a light filter placed near the lens; measured without the filter; measured as a function of the wavelength of the measuring light exciting the fluorescence; and measured when the intensity of the measuring light incident on the object was varied over wide limits, depending on the absorption of the object and the spectral sensitivity of the photomultiplier, are presented. S.C.W.

N65-32661 Joint Publications Research Service, Washington, D. C.

CHANGES IN ELECTRIC CHARACTERISTICS OF GIANT NEURON MEMBRANE DURING THE INCREASE OF OUTER CONCENTRATION OF POTASSIUM IONS

V. D. Gerasimov, P. G. Kostyuk, and V. A. Mayskiy *In its* Current Soviet Studies in Biophys. 28 Jul. 1965 p 17-30 refs (See N65-32658 21-04) CFSTI: $3.00

The effect of differing concentrations of potassium ions in the ambient medium on the electrical characteristics of giant neuron membranes of the grape snail was studied. Presented are data on the dependence of the transmembrane potential difference on the ambient potassium ion concentration, variation of the membrane resistance with the ambient potassium ion concentration, and characteristics of the action potential (AP) of cells depolarized by increased concentration of potassium ions. S.C.W.

N65-32662 Joint Publications Research Service, Washington, D. C.

ELECTRIC MODEL OF A NERVE FIBER. PART II: CONNECTION BETWEEN THE FUNCTIONAL PROPERTIES OF A FIBER AND ITS DIAMETER AND ION DIFFUSION IN AXOPLASMA

G. N. Berestovskiy *In its* Current Soviet Studies in Biophys. 28 Jul. 1965 p 31-42 refs (See N65-32658 21-04) CFSTI: $3.00

An electrical model of a nerve fiber with improved analogs of the external and internal fiber media is described. Using this improved version of a previous model, the role played by the protoplasm and its diffusion processes during excitation of the nerve was studied. Presented are data on the model cell with distributed storage, and data on the reaction of the cell to long-term external action. Also included are data which demonstrate the applicability of the proposed model to studies of other excited structures. S.C.W.

N65-32663 Joint Publications Research Service, Washington, D. C.

LIGHT STIMULATION OF RAIN WORM GIANT AXON

R. G. Lyudkovskaya and T. K. Pangelova *In its* Current Soviet Studies in Biophys. 28 Jul. 1965 p 43-47 refs (See N65-32658 21-04) CFSTI: $3.00

The feasibility of using monochromatic UV- and visible-light to stimulate an isolated giant axon of the rain worm was studied, and an attempt made to identify the light acceptor. Presented are data on the nature of the electrical reaction caused by light sources, and the interactions of individual regions of UV and visible light. S.C.W.

N65-32664 Joint Publications Research Service, Washington, D. C.

THE EFFECT OF A CONSTANT MAGNETIC FIELD ON PARAMECIUM MOVEMENT

A. B. Kogan and N. A. Tikhonova *In its* Current Soviet Studies in Biophys. 28 Jul. 1965 p 48-55 refs (See N65-32658 21-04) CFSTI: $3.00

The effect of a constant magnetic field on the behavior of *Paramecium caudatum* was studied on the basis of a precise index of its movement. Observed were movements in the interpolar space- and near one pole of a constant magnet. Placement of a capillary between the poles of a permanent magnet changed the velocity of movement of the organism so that its dwell time at the south pole was greater than at the north. Capillary placement at either pole of a magnet showed that the recession of the organism from the south and recession from the north of the organism from the south and approach to the north poles was retarded, and the approach to the south and recession from the north were accelerated. The influence of the magnetic field on the motion of the organism developed gradually and did not disappear immediately upon removal of the field. The influence of the magnetic field also increased with an increase of field strength. It is further noted that the magnetic field may exert its influence on paramecium by changing the properties of the nutrient medium. S.C.W.

N65-32674*# Emory Univ., Atlanta, Ga.

EFFECT OF WEIGHTLESSNESS AND RADIATION ON THE GROWTH OF THE WHEAT COLEOPTILE FOR THE PURPOSE OF DEFINING AND VERIFYING AN EXPERIMENT SUITABLE FOR USE IN A BIOSATELLITE

Stephen Gray and Betty F. Edwards Washington, NASA, Sep. 1965 64 p refs

(Grant NsG-521)

(NASA-CR-303) CFSTI: HC $3.00/MF $0.75 CSCL 06C

The effects of gravity, temperature, and radiation on growth of wheat seedlings were studied experimentally. Wheat coleoptiles, primary roots, and secondary roots were placed in centrifuge space flight simulation chambers; they were exposed to temperatures from 21 to 29° C, x-ray irradiation up to 40 000 r, and centrifugation of 150 G for periods varying from 48 to 96 hours. Measurements of growth rate show that the optimal temperature for growth is 25° C, and that it is at that temperature that centrifugation and radiation have maximum anomolous effect; furthermore, at temperatures from 21 to 25° C the elevated gravity stimulated growth, and the 150 G force also served to reduce seedling sensitivity to radiation. J.M.D.

N65-32679 Library of Congress, Washington, D. C. Aerospace Technology Div.

THE SECOND "MAN-IN-SPACE" SYMPOSIUM AND PROBLEMS OF VOSKHOD-2 LIFE SUPPORT SYSTEMS

Boris Mandrovsky *In its* Foreign Sci. Bull., Vol. 1, No. 8 Aug. 1965 p 21-27 refs (See N65-32675 21-34)

Information imparted by Soviet scientists in formal papers and informal discussions at this Symposium (held in Paris, 14-18 June 1965), provides an overview of the scope and diversity of their basic program in space biology, identifies new research trends and pinpoints problem areas in bioastronautics, clarifies certain misconceptions concerning procedures and equipment employed in Leonov's EVA, and indicates probable future goals of the Soviet manned space-flight program. Author

N65-32693# Army Biological Labs., Fort Detrick, Md.

GRAPHITIZATION OF CAST IRON AS AN ELECTRO-BIOCHEMICAL PROCESS IN ANAEROBIC SOILS

C. A. H. von Wolzogen Kühr and L. S. van der Vlugt 3 Mar. 1964 50 p refs Transl. into ENGLISH from Water (The Hague), v. 18, no. 16, 3 Aug. 1934 p 147-165 *Its* Transl. No. 1021

(FD3-3957(T-166); AD-617552)

Corrosion of cast iron in the ground was classified as to rust formation or graphitization; iron oxide being the corrosion product of the rust and iron sulfide of graphitization. The fact that extensive corrosion of iron has been observed in soils with only weak sulfate reduction, even though cast iron pipes in such soils may have a high layer of high iron sulfide content, leads to the conclusion that graphitization is not a purely chemical sulfur corrosion. Sulfate reduction in the ground was considered as a natural accumulation process, and it was concluded that this reduction serves as a depolarizer in the corrosion cell and the iron goes into the solution anodically. This anaerobic corrosion of iron was, therefore, regarded as an electro-biochemical process. Iron pipes are considered unsuitable for soils which are considered to possess chemical sulfate agressiveness. M.W.R.

N65-32709# Library of Congress, Washington, D. C. Aerospace Technology Div.

CBE FACTORS Surveys of Soviet-Bloc Scientific and Technical Literature

16 Jul. 1965 77 p refs

(ATD-B-65-43; AD-618467)

A bibliography of Soviet open source literature in the categories of aerosols, biological pathogens, and chemical substances is presented. Abstracts are included for most of the articles, all of which were published prior to 31 December 1962. M.W.R.

N65-32718*# California Univ., Los Angeles. Space Biology Lab.

RESULTS OF ELECTROENCEPHALOGRAPHIC EXAMINATIONS UNDER THE INFLUENCE OF VIBRATION AND CENTRIFUGING IN THE MONKEY

W. R. Adey, R. T. Kado, and D. O. Walter [1965] 34 p refs (Contract NAS9-1970)

(NASA-CR-65018) CFSTI: HC $2.00/MF $0.50 CSCL 06P

Effects of whole body vibration on cortical and subcortical EEG activity were tested over the range of 5 to 40 c/sec in three normal monkeys and in three monkeys who had undergone surgery six months previously for bilateral section of the vestibular nerves. Animals were blind-folded during the vibration periods. Induced EEG rhythmicity at certain frequencies had the characteristics of physiological "driving" and appeared to be distinguishable from superficially similar phenomena of artifactual origin. Autospectral density plots indicated little or no evidence of EEG driving below 9 c/sec; driving at the shaking rate was maximal between 10 to 15 c/sec; and in many instances maximum EEG energy peaks occurred at other than shaking frequencies. Shaking in the range 11 to 17 c/sec produced many coherent relationships at fundamental driving frequencies, and the bilateral section did not abolish this driving. Brief centrifuging to high G levels was followed by paroxysmal cortical and subcortical slow wave activity associated with missed cardiac beats. M.W.R.

N65-32744# Ohio State Univ. Research Foundation, Columbus.

A FURTHER STUDY OF THE INFLUENCE OF A RELEVANT BUT "UNUSED" CUE IN TRAINING UPON TRANSFER IN A POSITIVE TRANSFER SITUATION **Final Report**

Gordon A. Eckstrand, Alan D. Neiberg, and Ross L. Morgan Wright-Patterson AFB, Ohio, AMRL, Sep. 1964 111 p refs (Contract AF 33(038)-5474)

(AMRL-TDR-64-81; AD-607472)

This study was an attempt to assess the utility of a cue that was relevant but not used in the solution of a first task in the learning of a second task. The relationship was such that if something were learned about the relevant but "unused" cue, positive transfer would be expected to occur. In an earlier experiment, no positive transfer was found in this type of situation. The present study essentially duplicated the first but involved an important procedural modification. This modification was intended to rule out the possibility that subjects in the first study had been trained to disregard this relevant but unused cue. The findings of the present study support those of the earlier one. Even with the revised procedure, no transfer was shown from learning the first task to the learning of a second task on the basis of the cue that was originally relevant but unused. Author

N65-32754*# National Aeronautics and Space Administration. Washington, D. C.

THE USE OF INTERFERENCE CURRENTS IN THE COMBINED EXCLUSION OF PAIN IN SURGICAL OPERATIONS [DIE VERWENDUNG VON INTERFERENZSTROMEN IN DER KOMBINIERTEN SCHMERZAUSSCHALTUNG BEI CHIRURGISCHEN OPERATIONEN]

N. I. Kuzin, V. D. Zhukovskiy, and V. N. Sachkov Aug. 1965 18 p refs Transl. into ENGLISH from Acad. of Med. Sci., USSR

(NASA-TT-F-9546) CFSTI: HC $1.00/MF $0.50 CSCL 06E

Interference phenomena of two currents with similar frequency were used to obtain above-threshold narcotic effects in the deeper human organs with below-threshold current strength. A special generator for interference currents was developed and used to determine, on the eve of operations, the particular minimal strength which would just barely induce superficial analgesia in 30 patients. The observed threshold varied from 2.5 to 12 mA, and was generally higher in males than in females. Actual electronarcosis of 26 premedicated patients during various surgical procedures eliminated pain completely in 24 patients; in two patients elimination of pain was not complete at the beginning of the operation due to incorrect current strength. It was concluded that the proper choice of the narcotizing current strength is of utmost importance. Only two patients complained of muscle pains, and one person of headaches, during the postoperative period; no other complications were observed. G.G.

N65-32760# Joint Publications Research Service, Washington, D. C.

RESULTS OF EXPERIMENTAL CHECKING OF MATHEMATICAL MODELS FOR DETERMINING COMBINATIVE ABILITY

N. V. Turbin, L. A. Tarutsina, and L. V. Khatylyeva 2 Sep. 1965 14 p refs Transl. into ENGLISH from Vestsi Akad. Navuk Belarusk. SSR, Ser. Biyal. Navuk (Minsk), no. 1, 1965 p 74-81 (JPRS-31830; TT-65-32325) CFSTI: $1.00

Mathematical methods are used to determine combinative capability of parental lines in corn and to compare results of data processing with four experimental methods of interbreeding. Dial interbreeding of 7 × 7 self-fertilized corn lines, with length of the cob the criterion, was used and the experiment was repeated five times on the basis of randomized blocks. Variance analyses are presented for the four methods. From these data it is shown that one parental line can be used successfully as a component of the syntactical quality, while another line is more valuable in specific combinative crossings. A formula is given for estimating the variance of the specific line which can be used to compare the specific combinative capabilities of a line belonging to a series of hybrids with a self-fertilized line. M.W.R.

N65-32762# Joint Publications Research Service, Washington, D. C.

SOME PRINCIPLES OF MACHINE DIAGNOSTICS

M. I. Anokhin 9 Sep. 1965 9 p Transl. into ENGLISH from the book "Methodologicheskiye Problemy Diagnostiki" Moscow, 1965 p 185-192

(JPRS-31926; TT-65-32420) CFSTI: $1.00

Discussed are mathematical logic and probability theory principles of cybernatic devices that are used for diagnostic purposes in medicine. Completely independent symptoms have a particular value in calculating disease probabilities. Diagnostic programming contains a merging of results obtained by means of deterministic logic, probability logic, phase interval logic, and simple methods. A knowledge of the etiology and the pathological mechanisms of disease is required from the doctor to interpret the external signs correctly for processing in cybernetic machines. G.G.

N65-32793# General Precision, Inc., Glendale, Calif. Lab. for Automata Research.

[INTERNEURONAL TRANSFER FUNCTIONS AND FUNCTIONAL RESPONSE CHARACTERISTICS OF NERVE CELLS] **Semiannual Report**

E. R. Lewis et al Jan. 1964 111 p refs

(Contract AF 49(638)-1236)

(SAR-7)

Three studies concerning theoretical and electronic models of nerve cell function are reported. A preliminary report is given on a project in which electronic analog circuits are being used to explore synoptic transfer functions and to study the relationships between the functions and the modern ionic hypothesis. In an investigation of gas-ion systems operated as neurons which fire only once for each excitatory input, measurements were made of the time lag between stimulation and discharge. Initial theoretical considerations in a study of behavior in large discrete state association systems are presented. J.M.D.

N65-32824# California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology
ECOLOGY OF THE NEVADA TEST SITE. III: SURVIVAL OF WINTER ANNUALS, 1963–64
Janice C. Beatley Apr. 1965 21 p refs
(Contract AT(04-1)-GEN-12)
(UCLA-12-555)

Experiments were conducted to determine the ability of winter annual species to survive from the seedling stage in ground that had been contaminated with nuclear radiation. The tests were performed in drainage basins at the Nevada Test Site during the winter of 1963–64; the ground had been subjected to radiation contamination since 1962. Over half of the plants died, but it is thought that elimination of the majority of seedlings before maturity is probably a regular phenomenon. J.M.D.

N65-32829# Oak Ridge National Lab., Tenn. Health Physics Div.
EFFECTS OF SHELL CORRECTIONS TO STOPPING POWER IN THEORETICAL DOSE STUDIES
J. E. Turner [1964] 13 p refs
(Contract W-7405-ENG-26)
(ORNL-P-659; CONF-803-2)

The theoretical evaluation of absorbed radiation dose in tissue from external sources is based on the absorbed energy and rate of linear energy transfer (LET) calculated from the Bethe stopping-power formula. For the chemical elements in tissue, it is known experimentally that shell corrections to the Bethe formula are needed for incident particle energies in the range 0 to 15 MeV. Shell correction curves that agree with experimental data for protons with a number of metals, ranging in atomic number from Be to Pb, have been developed. This work is applied to the light elements present in soft tissue. Shell correction curves, estimations of the mean excitation energies and the results of several theoretical studies based on this work are presented. Author

N65-32833# Argonne National Lab., Ill.
EFFECT OF X-RAYS AND γ-RAYS OF Co^{60} UPON THE GROWING RABBIT LARYNX: A CONTRIBUTION TO THE RB-EFFECT OF THE Co^{60} γ-RADIATION UPON THE CARTILAGE [WIRKUNG DER RONTGEN- UND DER GAMMA-STRAHLEN DES Co^{60} AUF DEN WACHSENDEN KEHLKOPE DES KANINCHENS: EIN BEITRAG ZUR RBW DER Co^{60}-GAMMA-STRAHLUNG AUF DEN KNORPEL]
Th. Hornykiewytsch Oct. 1964 5 p Transl. into ENGLISH from Biophysik (Berlin), v. 1, 1964 p 222–223
(ANL-Trans-121)

The biological effectiveness of 200 kv X-rays and γ-rays of Co^{60} upon the growing larynx (cartilage) of infantile rabbits was studied experimentally. Experimental conditions are given. After the rabbits had obtained a body weight of 2800 g from normal growth, they were sacrificed and the larynges dissected out. The radiation effect was determined by weighing of the larynx and planimetry of the cross sections of its cartilages (thyroid, arytenoid, and ring cartilage). The unit time irradiation of the infantile larynx with 500 r roentgen radiation resulted in an insignificant growth inhibition of the larynx. The strongest effect appeared after the administration of 1000 r and could not be increased to a significant extent by an increase of the radiation dose to 2000 r. After 3000 r all rabbits perished from a therapyresistant edema with consecutive suffocation. In the dose region of 500 to 3000 γr and a unit time exposure the irradiation with Co^{60} was less effective than with 200 kv X-rays. The factor for the relative biological effectiveness ($RBE_{roentgen}$) of single dose regions was determined by calculating the confrontation of the X-ray and Co^{60} radiation doses required for producing an equal decrease of the larynx weight and growth. L.S.

N65-32842# Brookhaven National Lab., Upton, N. Y. Dept. of Biology.
RADIATION DAMAGE AND RECOVERY IN MAMMALIAN CELLS
Howard J. Curtis [1964] 15 p refs
(Contract AT(30-2)-GEN-16)
(BNL-8469; Conf-801-1)

Experiments were conducted to determine why different mammalian organs have vastly different radiation sensitivities. Radiation effects at low dosages are due almost entirely to chromosomal damage, and in the mammal cell all somatic cells seem to suffer about the same chromosomal damage for equal doses. The different radiation sensitivities observed for different mammalian organs is due to recovery mechanisms within the cell which can repair a great deal of the damage over a period of days or months provided the cells are not required to undergo division. A highly differentiated cell needs only a small fraction of its total genetic complement for normal function, so the probability of a hit on a sensitive site is greatly reduced. If a cell has a large RNA pool it can function on this for a long time after vital DNA is inactivated, and while the DNA is undergoing recovery. R.N.A.

N65-32876*# National Aeronautics and Space Administration, Washington, D. C.
ABSTRACTS OF FIVE BIOMEDICAL PAPERS ON RESULTS OF SOVIET MANNED SPACE FLIGHTS
I. T. Akulinichev et al Aug. 1965 14 p Transl. into ENGLISH from Russian 14 p
(NASA-TT-F-9536) CFSTI: HC $1.00/MF $0.50 CSCL 05J

Papers dealing with cosmonaut work capacity, physical reactions of man to acceleration during space flight, and noise normalization in life support systems in spacecraft cabins during prolonged flight are summarized. Results of some electrophysiological investigations conducted on the Voshkod I spacecraft are abstracted as are findings of a study of Chlorella cultures as a link in an ecosystem. M.W.R.

N65-32926*# Space/Defense Corp., Birmingham, Mich.
THE RESPONSE OF SQUIRREL MONKEYS TO HIGH ACCELERATIVE FORCES
John N. Mehelas and Bruce W. Pinc Washington, NASA, Jun. 1965 323 p refs
(Contract NASw-851)
(NASA-CR-236; TR64-111) CFSTI: HC $7.00/MF $1.75 CSCL 06S

Squirrel monkeys were exposed to accelerative forces from 50 G to 430 G at increments of approximately 50 G, and dwell periods ranging from 2 to 386 seconds in a centrifuge. Data recorded included clinical observations, electrocardiograms (ECG), gross pathology, and histochemical changes in tissues. From these data it was concluded that the monkey is capable of sustaining and surviving 430 G for 115.6 seconds. The pathologic response to stress differed between low, middle, and high ranges. Protection of the animal against certain aspects of stress was possible and extension of its tolerance to stress appeared feasible. Cardiac events indicated by ECG changes, included evidence of anatomical displacement under stress with severe muscle noise. Clear patterns of ischemia, myocardial infraction, and arrhythmias were seen, with tachycardia, bradycardia, and variations in amplitudes and durations of the trace elements. A mathematical hypothesis was developed which permitted calibration of the monkey to G stress at constant onset and offset rates. The hypothesis was tested successfully with many predictions regarding the lethality and non-lethality of monkey exposures. R.N.A.

N65-32928# Purdue Univ., Lafayette, Ind.
MOTIVATIONAL CORRELATES OF INDIVIDUAL DIFFERENCES IN PERFORMANCE Technical Report, May 1961–Jan. 1965
Mark W. Stephens and K. M. Michels Wright-Patterson AFB, Ohio, AMRL, May 1965 151 p refs
(Contract AF 33(616)-7962)
(AMRL-TR-39; AD-618895)

A three-year program of research was directed at the development of "paper and pencil" measurement techniques that would permit the assessment of the potential "motivatability" of subjects in experiments concerning the effects of environmental stress on human performance. A largely empirical approach was used in this research. Performance measures of a large number of subjects on several different tasks were used as the criterion measures in item analyses of several personality inventory tests. The resultant pool of cross-validated items will, it is hoped, represent a step toward increasing the precision of performance research. Author

N65-32973*# National Aeronautics and Space Administration, Washington, D. C.
DESOXYRIBONUCLEIC ACID COMPOSITION AND CERTAIN PROBLEMS IN THE EVOLUTION OF PHOTOSYNTHESIZING BACTERIA [SOSTAV DNK I NEKOTORYYE VOPROSY EVOLYUTSII FOTOSINTEZIRUYUSHCHIKH BAKTERIY]
B. F. Vanyushin, N. A. Kokurina, and A. N. Belozerskiy Sep. 1965 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 158, no. 3, 1964 p 722-725
(NASA-TT-F-316) CFSTI: HC $1.00/MF $0.50 CSCL 06M

In the interest of learning more about the evolution and species specificity of the relatively obscure autotrophic bacteria, the authors studied the nucleic acid composition of five bacterial species of the pseudomonadales order, including: one autotrophic green sulfur photosynthesizing; one purple sulfur photosynthesizing; one purple nonsulfur phototrophic; two colorless sulfur species. The taxonomic basis for the study was the nucleotide constituency of the desoxyribonucleic acid (DNA) in the micro-organisms, as well as their morphological and physiological attributes. The evidence indicates a phylogenetic relationship between the green photosynthesizing bacteria, some colorless sulfur bacteria, azotobacters, and the blue-green algae, as well as a common heredity linking these organisms. Other interrelationships, including those with certain heterotrophic species, possible common origins, and favorable directions of evolution are discussed in light of DNA structure. Author

N65-32989# Commissariat a l'Energie Atomique, Saclay (France). Departement de la Protection Sanitaire.
ANATOMO-PHYSIOLOGICAL SCHEMA OF THE GASTRO-INTESTINAL TRACT, TO BE TAKEN IN ACCOUNT IN DETERMINING THE LEVELS OF RADIOACTIVE CONTAMINATION [SCHEMA ANATOMO-PHYSIOLOGIQUE DU TRACTUS GASTRO-INTESTINAL A PRENDRE EN CONSIDERATION POUR LE CALCUL DES NIVEAUX DE CONTAMINATION RADIOACTIVE]
Claudine Fabry Mar. 1964 25 p refs In FRENCH; ENGLISH summary
(CEA-R-2413; EUR-489-f) CFSTI: HC $1.00/MF $0.50

Anatomical and physiological data of the gastrointestinal tract of adults and children were summarized in a standard schema, to be used in calculating the levels of radioactive contamination, in the food chain. Author

N65-33012# Indiana Univ., Bloomington.
AN INVESTIGATION OF VISION DURING INVOLUNTARY SACCADIC EYE MOVEMENTS
Robert Wesley Ebbers (M.S. Thesis) Jun. 1965 42 p refs
(Contract AF 33(608)-1070)
(AD-617409)

A study designed to determine the presence or absence of vision during involuntary saccadic eye movements is reported. Considered are involuntary movements occurring during normal steady fixation. Studied were male graduate students with 20/20 vision. It was shown that vision is present during the involuntary saccade, and that while vision is present, it is dependent in part upon stimulus intensity. Results indicate quite consistent, and large magnitude, intensity threshold differences between subject and observer. Differences were further reflected by an impairment of suprathreshold vision during the involuntary saccade, shown by blip-counting experiments and by measurements of visual acuity. This impairment was shown to be related to the optical smear of the retinal image, the greater the speed of movement of the retinal image, the greater the visual impairment. It is concluded that, contrary to findings of other investigators, vision does exist, though impaired, during involuntary saccadic eye movements, as well as during voluntary saccadic eye movements. S.C.W.

N65-33014# United Kingdom Atomic Energy Authority, Amersham (England). Radiochemical Centre.
MEASUREMENT OF THE SPECIFIC ACTIVITY OF RESPIRED CARBON-14 DIOXIDE AS A METHOD OF HEALTH PHYSICS CONTROL
D. A. Cook and G. H. C. Dancer May 1965 15 p refs
(RCC-R-178) CFSTI: HC $1.00/MF $0.50

A method for the measurement of the specific activity of respired carbon-14 dioxide is described. The carbon dioxide is extracted from a breath sample into sodium hydroxide solution. It can be released, when required, by the addition of an excess of lactic acid and used as the 'filling' of a proportional counter. A limiting sensitivity of 3×10^{-8} μc carbon-14 per ml carbon dioxide is obtained. Some results of measurements on persons who work in a laboratory which processes many curies of carbon-14 annually are given. They show that large quantities of this material may be handled safely in standard fume cabinets and vacuum manifold systems. Author

N65-33020# Rochester Univ., N. Y. Atomic Energy Project.
BRIEF DESCRIPTION OF MOST OF THE RESEARCH PROGRAMS COMPLETED DURING 1964 Annual Report
Henry A. Blair 9 Jan. 1965 175 p refs
(Contract W-7401-ENG-49)
(UR-668)

Radiation studies in the fields of biology and medicine were conducted to determine general radiation effects, the toxicity of radioelements, molecular and cellular levels, and chemical toxicity. Research was also conducted on radiation instruments, applications of radioisotopes, physiologic effects of radiation, and use of microwaves in radiobiologic research. The scope of the investigation, the methods used, the data resulting, and the conclusions reached are summarized for each report. M.G.J.

N65-33022# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
HANFORD RADIOLOGICAL SCIENCES RESEARCH AND DEVELOPMENT Annual Report, 1964
D. S. Pearce and J. K. Green ed Jan. 1965 457 p refs
(BNWL-36)

Research is reported under the following subject headings: *Atmospheric Physics; Radiological Physics; Radiological Chemistry; Chemical Effluents Technology,* and *Instrumentation.* Among the studies presented are cited: precipitation

scavenging studies; studies of seasonal variations of Cs^{137} in Alaskan eskimos; research on the kinetics of diffusion through human erythrocyte membranes; techniques used in the radiochemical determination of plutonium in urine; airborne-radionuclide measurements and physical characteristics determinations; studies of several adsorption, diffusion, and dispersion characteristics of anions in soils; and radiobiological-, biological-, biomedical-, dosimetry-, and atmospheric physics-instrumentation. S.C.W.

N65-33071# Joint Publications Research Service, Washington, D. C.
ADVANCES IN SPACE BIOLOGY
N. Sisakyan 13 Sep. 1965 7 p Transl. into ENGLISH from Krasnaya Zvezda (Moscow), 3 Jul. 1965 p 6
(JPRS-31954; TT-65-32448) CFSTI: $1.00

Discussions are presented on several new developments in space biology concerned with physiological effects of physical factors of the space environment such as vacuum, cosmic and solar radiation, and temperature; and the artificial spacecraft environmental factors such as pressure, gaseous composition of the atmosphere, temperature, humidity, acceleration, vibration, and weightlessness on living organisms, in particular man. R.N.A.

N65-33128*# Midwest Research Inst., Kansas City, Mo.
MEDICAL APPLICATIONS OF NASA-DEVELOPED SCIENCE AND TECHNOLOGY Quarterly Progress Report No. 2, 30 Apr.–31 Jul. 1965
R. W. Fetter, C. C. Craghead, P. L. Smith, and J. M. Brick [1965] 17 p refs
(Contract NASr-63(03); MRI Proj. 25-63-M(E))
(NASA-CR-64601) CFSTI: HC $1.00/MF $0.50 CSCL 06

Activities on a project for adapting aerospace technology to the field of medicine included continuing education of a multidisciplinary team from the medical and physical sciences, capable of recognizing potential application and adapting technology solutions to medical problems, through seminars and discussions. Other efforts included literature reviews to establish a state-of-the-art base line for evaluation of NASA technology and the definition of several problem areas in medicine where technology might readily be applied. R.N.A.

N65-33203# Joint Publications Research Service, Washington, D. C.
CHEMICAL BIONICS: HOPES AND POSSIBILITIES
A. P. Purmal' 15 Sep. 1965 18 p Transl. into ENGLISH from Khim. i Zhizn' (USSR), no. 4, 1965 p 43–52
(JPRS-32014; TT-65-32508) CFSTI: $1.00

A review of Soviet studies in chemical bionics is presented, with particular interest shown in the living cell as a chemical unit. The sustained chemical process in the living cell is proposed as an absolutely reliable control-regulation system based on chemical concentration, on which depends catalytic activity of enzymes. The minute concentrations of enzymes required for cellular regulation and their specificity lend them to industrial application on a large scale as an example of the useful design of the cell. Various species and their specific sense abilities are included as examples of bionic applicability to modern technology. W.M.R.

N65-33204# Joint Publications Research Service, Washington, D. C.
PROBLEMS OF THE MICROBIOLOGY OF HYDROCARBONS
N. D. Iverusalimskiy and G. K. Skryabin 17 Sep. 1965 8 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 1, Jan.–Feb. 1965 p 53-57
(JPRS-32055; TT-65-32548) CFSTI: $1.00

Early research efforts in hydrocarbon utilization by microbes is reviewed, and some problems of the microbiology of hydrocarbons are described. Among cultures of Gram positive bacteria and Gram negative aerobic bacteria, none was found able to use hydrocarbons. The relationship between the taxonomic position of the microorganisms and their ability to utilize aliphatic and cyclic hydrocarbons was studied in more than 2000 cultures of mold fungi, yeasts, bacteria, and actinomycetes. Results show that members of the Penicillium, Aspergillus, Fusarium, Candida, Phodotorula, and Torulopsis genera grew on media with liquid paraffins of the normal series as the only organic substances. W.M.R.

N65-33244# Colorado Univ., Denver. Cardiovascular Lab.
PULMONARY DIFFUSING CAPACITY IN PERSONS NATIVE TO HIGH ALTITUDE
A. C. DeGraff, Jr., R. F. Grover, J. W. Hammond, Jr., J. M. Miller, and R. L. Johnson, Jr. [1965] 30 p refs Prepared jointly with Texas Univ.
(Contract AF 41(609)-2691)
(AD-463110)

A study was conducted to measure the lung membrane diffusing capacity for carbon monoxide (D_{MCO}) in persons native to high altitudes and compare these with similar measurements in nonaltitude acclimated sea level residents. The study demonstrated that high altitude natives have significantly higher D_{MCO} than do sea level natives. The D_{MCO} of sea level natives does not increase with acclimatization to altitude. The normal relation between blood flow and lung capillary blood volume does not hold in sea level natives exercising at altitude thereby potentially causing increased nonuniformity of red cell lung capillary transit time. For the altitude studied, sea level natives reach near peak maximal oxygen consumption (MOI) after only two days at altitude, with only minor further increase in MOI occurring after four weeks at altitude. Sea level measurements of resting D_{MCO} and capillary volume closely predicted arterial saturation of subjects exercising at altitude. R.N.A.

N65-33251*# RAND Development Corp., Cleveland, Ohio.
ANALYSIS OF THE DYNAMIC SYSTEMS RESPONSE OF SOME INTERNAL HUMAN SYSTEMS
A. S. Iberall 1 Apr. 1964 146 p refs
(Contract NASw-678)
(NASA-CR-64641) CFSTI: HC $4.00/MF $1.00 CSCL 06P

Regulation and control of the human core temperature regulating system, the cardiovascular system, the hormonal system, and the behavioral system were studied from a physical point of view. It was found that all internal sub-systems in the biological system consist of limit cycle oscillators, and that the system is governed both chemically and electrically by moderating the stability of these oscillators. It is proposed that oscillator complexes in non-linear mechanics will bridge the foundational problems in Adrian neurophysiology, Freudian psychoanalysis, Pavlovian conditioned reflex concepts, Hull behaviorism, and Wiener cybernetics. G.G.

N65-33252*# Naval School of Aviation Medicine, Pensacola, Fla.
THE INFLUENCE OF VIBRATIONS ON CHROMOSOMES
James C. Knepton, Jr. 12 Apr. 1965 21 p refs Joint report with NASA
(NASA Order R-39)
(NASA-CR-64642; NSAM-924) CFSTI: HC $1.00/MF $0.50 CSCL 06F

This report gives the results of an initial series of experiments in which cells from various organisms were vibrated at frequencies of 40 and 70 cps with 10 and 20 G's. Microspores

of *Tradescantia paludosa* (Clone 3 of Sax), conidia of *Neurospora crassa* (L-prolineless clock-mutant, FGSC No. 491a), *Neurospora crassa* (N.R.C. No. 865A), and ova, larvae, and pupae of *Drosophila melanogaster* (wild type) were studied for chromosomal rearrangements. No influence was found of these vibration frequencies and accelerations on *N. crassa*, *T. paludosa*, and the P_1 generation of *D. melanogaster*, but there was observed the presence of body color and wing shape mutants among the F_1 generation of *D. melanogaster*. In future work these organisms will be subjected to other frequencies and displacements of vibration. Author

N65-33256*# Bio-Dynamics, Inc., Cambridge, Mass.
AN EVALUATION OF THE ROLE OF TRAINING IN THE SUPPRESSION OF THE MOTION SICKNESS SYNDROME: A REVIEW OF RESEARCH AND ANECDOTAL SOURCES
Arthur Taub et al 11 Jan. 1963 168 p refs
(Contract NASw-553)
(NASA-CR-64639) CFSTI: HC $5.00/MF $1.00 CSCL 06S

A summary and analysis of the effectiveness of training in suppression of motion sickness is presented. A literature review and experimental studies, relating to the vestibular physiology and motion sickness, confirmed that the motion sickness syndrome can be suppressed by means of training. Individual differences in acquiring habituation to motion are varying, and prolonged flights of future space programs may require special vestibular training procedures. The use of interoceptive conditioning techniques—as making the trainee aware of the earliest signs of motion sickness and thereby facilitating his control of suppression mechanism—is advocated as one efficient training method. This and other approaches to training should be evaluated and compared with the protection afforded by drugs. G.G.

N65-33261*# National Aeronautics and Space Administration, Washington, D.C.
CEREBRAL RHEOGRAPHY AND ITS DIAGNOSTIC POSSIBILITIES IN CLINICAL PRACTICE
A. Belluschi and V. Vacchini Aug. 1965 57 p refs Transl. into ENGLISH from Osped. Maggiore (Milan), v. 59, 1964 p 201-238
(NASA-TT-F-9497) CFSTI: HC $3.00/MF $0.50 CSCL 06E

The authors have taken up the problem of interpreting cerebral rheography. After having reported upon present knowledge on the subject, they examine the diagnostic possibilities of this knowledge and come to the conclusion that the interpretative procedure is at present entirely inadequate for furnishing data worthy of attention. Basing themselves on the hemodynamic laws which define the behavior of the cerebral flow and taking advantage of the ideas expressed in various authors' investigations using the nitrogen protoxide method, they see cerebral rheogram interpretation prospectively as an expression of the flow as a function of vascular resistance and arterial pressure. To confirm this interpretative procedure, they give numerous examples from their case histories showing an effective correspondence between the ascending limb of the rheographic wave and the vascular resistance. Author

N65-33289# Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg (West Germany). Institut für Flugmedizin.
ON THE METHODOLOGY AND PRACTICABILITY OF A PSYCHOMOTORIC TEST FOR PERFORMANCE PROGNOSES [ZUR METHODIK UND ARBEITSPROGNOSTISCHEN ANWENDUNG EINES PSYCHOMOTORISCHEN TESTVERFAHRENS]
E. Tismer Jun. 1965 52 p refs In GERMAN; ENGLISH summary
(DLR-FB-65-27; DVL-418) CFSTI: HC $3.00/MF $0.50

Methodology and practical applicability of a psychomotoric test (pellet test recorder) for performance prognoses are critically evaluated under consideration of the Lienert test efficiency criteria. Author

N65-33319# Aerospace Medical Div. Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THERMAL EVALUATION OF FOOTGEAR ASSOCIATED WITH THE FULL PRESSURE HIGH ALTITUDE FLYING OUTFIT A/P 22S-2 Technical Report, 20 Nov.-9 Dec. 1963
Frederick A. Milan Jun. 1965 9 p refs
(AAL-TR-64-25; AD-469243)

Four different footgear assemblies were tested by five human subjects dressed in the A/P 22S-2 garment sitting at rest at −30° C in a temperature-controlled room. Toe temperatures were measured during the 120-minute test. These data show that after 120 minutes of exposure, mean toe temperatures of the subjects wearing the AF mukluks (N1B) and the white Vapor Barrier boots were the same (16° C). Mean toe temperatures of subjects wearing the Alert boots fell to 9° C after 120 minutes; two of the original five subjects wearing Alert boots, however, were removed from the test situation after 90 minutes because their toe temperatures fell to 2° C. The mean toe temperatures of subjects wearing a down-filled survival overboot were 20° C after 120 minutes. Author

N65-33342# Naval Medical Research Inst., Bethesda, Md.
ELEVATION OF INTERNAL BODY TEMPERATURES DURING TRANSIENT HEAT LOADS AND AT THERMAL EQUILIBRIUM
L. Copman, D. Minard, and A. R. Dasler 17 Jun. 1963 18 p refs
(Rept.-1; AD-429484)

Thermoregulatory responses of human subjects undergoing heat stress were studied utilizing a variety of environmental conditions, clothing, and work rates. Internal body temperatures were measured in the lower esophagus (t_o), ear (tympanic membrane) (t_e), and the rectum (t_r). Skin temperatures, heart rate, sweat rate, and metabolic rate were also measured. At low rates of heat storage (5 to 25 Cal/M^2hr), the rates of rise of t_o, t_e, and t_r are approximately identical. During more rapid heat storage (50 Cal/M^2hr), the rates of rise of t_o and t_e are about equal and more rapid than that of t_r. When heat storage is greater (89 to 90 Cal/M^2hr), the rate of rise of t_o is greater than that of t_e. During work in the heat in which thermal equilibrium is attained, t_o and t_e reach equilibrium considerably sooner than does t_r, and the mean increase in t_r is 20 to 40% greater than that of t_e or t_o. It is concluded that t_o and t_e are more sensitive indicators of changes in internal temperature than is t_r during transient conditions, and t_r is a more reliable index of attainment of thermal equilibrium than are t_o or t_e. Author

N65-33345# Federal Aviation Agency, Oklahoma City, Okla. Aviation Medical Service.
PRIMARY, SECONDARY, AND CALORIC NYSTAGMUS OF THE CAT FOLLOWING HABITUATION TO ROTATION
William E. Collins Jul. 1963 21 p refs
(Rept.-63-13; AD-428756)

Ten cats were exposed to a series of above-threshold accelerations and sub-threshold decelerations. Unilateral caloric irrigations, provoking nystagmus in the same direction as the above-threshold rotational stimuli preceded and followed the set of accelerations. Although neither duration nor total slow-phase eye displacement to caloric stimulation was affected, the intervening rotational experience produced some reduction in the frequency of the nystagmic beats. Two factors

were proposed in explanation for the minimal transfer of adaptation from the rotational to the caloric situation. Secondary nystagmus activity was also examined and appeared closely related to preceding primary reactions. The data indicate that clinical (caloric) responses to vestibular stimulation may not give an accurate indication of a subject's state of adaptation to "practiced" levels of angular acceleration. Such findings provide cautions in the establishment of appropriate testing techniques for the analysis of vestibular function in air-or-space-vehicle crew members. Author

N65-33350*# National Aeronautics and Space Administration, Washington, D. C.
COMPUTER UTILIZATION OF TIME-LINE MEDICAL DATA FROM MAN IN SPACE FLIGHT
Jefferson F. Lindsey Sep. 1965 32 p refs
(NASA-TN-D-2695) CFSTI: HC $2.00/MF $0.50 CSCL 06B

A time-line approach was developed for a medical data computer program and involves preparing medical data on magnetic tape and on consecutive data sheets for appropriate portions of all manned space flights. Each data sheet shows all relevant information for a specified time interval, a 10 second interval during stressful periods such as exit and reentry, and a one minute interval during weightlessness. Data on each sheet includes analog and digital indicators of astronaut beat-to-beat heart rate, pulmonary ventilation, and various spacecraft environmental and astronaut performance measures. Identical types of data pertaining to each astronaut were recorded for comparable time periods for each of the six Mercury space flights and the Gemini flights to date. Selected ground based medical data were also prepared. Examples of analyses performed together with limitations are discussed. Graphical analyses, rate-of-change and rate-of-rate-of-change analyses, some computer programs for statistical analyses, and statistical model limitations are discussed. R.N.A.

N65-33364*# National Aeronautics and Space Administration, Washington, D. C.
THE APPLICATION OF MATHEMATICAL METHODS IN AVIATION AND SPACE MEDICINE, CONFERENCE, MOSCOW, FEBRUARY 25–26, 1965 Summary of Reports
K. A. Ivanov-Muromskiy et al Sep. 1965 39 p Transl. into ENGLISH of "Konf. po Primeneniyu Mat. Metodov v Aviats. i Kosmich. Med., 25–26 Fevralya 1965" Akad. Nauk SSSR (Moscow), 1965
(NASA-TT-F-374) CFSTI: HC $2.00/MF $0.50 CSCL 06E

Summaries are presented for 22 reports given at a conference dealing with the application of mathematical methods to aviation and space medicine. Subjects discussed include the use of computers for analyzing bioelectric activity of the brain, processing biomedical data, investigating control systems which include man, and for evaluating respiratory functions. The use of punch cards, a system of input devices, magnetic recordings, the application of dispersion method, and statistical indicators are considered with respect to various aeromedical problems. M.W.R.

N65-33374# Navy Electronics Lab., San Diego, Calif.
MARINE BIOLOGICAL SOUND WEST OF SAN CLEMENTE ISLAND. DIURNAL DISTRIBUTIONS AND EFFECTS ON AMBIENT NOISE LEVEL DURING JULY 1963 Research Report, Jan.–Dec. 1964
P. O. Thompson 24 May 1965 41 p refs
(NEL-1290; AD-467351)

A survey was made of the biological sound present in a set of tape recordings obtained from hydrophones at 60 and 450 fathoms, over an 8-day period. A variety of types of biological sound were distinguished and analyzed. They were shown to have significant influence on the ambient noise level. Of the variety and quantity of biological sound in the samples, eight types were found to be most prevalent. Barking and 20 c/s long pulses were present during the 192 hours monitored, at both hydrophones. An almost-continuous drone of rhythmic grunt appeared to be largely responsible for an increased base ambient noise level that occurred in the 80 c/s to 300 c/s region peaking just before midnight at the deep hydrophone. Peaks in the base ambient noise level at 2000 and 0400 hours in the 160 c/s to 1000 c/s range at the shallow hydrophone were mainly the result of increased activity of the click chorus. R.W.H.

N65-33388# Nebraska Univ., Lincoln.
A STUDY OF AIR FORCE PERSONNEL PROBLEMS ASSOCIATED WITH REMOTE OR ISOLATED ASSIGNMENTS
Jack E. Ladds 1965 118 p refs
(AD-615631)

Air Force personnel problems were studied on remote installations. Major areas considered were environmental factors, job conditions, personnel practices, career factors, and compensation. Results show that the Air Force is unable to retain its skilled and hard core technicians beyond their first enlistment. Living conditions and recreational facilities are unsuitable at remote overseas stations. The benefits derived by improving these facilities would probably be offset by savings in training costs that would accrue from a higher retention rate. This would, in turn, relieve the tedium of monotony. The proposed monthly basic pay rates fall short of raising military compensation to a level comparable to civilian and government segments of the economy. There is a need for a status symbol or recognition factor to increase prestige of men at remote sites. Efforts to develop and use selection methods as a means of minimizing adjustment problems and thus improve morale and retention of personnel assigned to isolated stations have proven only marginally successful. R.N.A.

N65-33405# Ohio State Univ., Research Foundation, Columbus.
VISUAL RECOVERY Technical Documentary Report No. 2
Norma D. Miller Brooks AFB, Tex., School of Aerospace Med., Apr. 1965 35 p refs
(Contract AF 33(657)-9229)
(SAM-TR-65-12; AD-450072)

Maximum flash-field luminances of 5.4×10^5 L. were produced by a xenon-filled discharge tube seen by Maxwellian view. The field diameters were varied from 10° to 20 minutes of arc and the flash exposures were varied from 0.04 msec. to 1.4 msec. The maximum flash energy was 0.042 cal/cm^2 at the retina, neglecting losses in the ocular media. During most of the experimental work, the maximum flash energy was reduced to 0.012 cal/cm^2 at the retina by the use of an infrared blocking filter. The flash luminances were varied over a 30 to 1 range. The criterion measure for recovery times following the flashes was the correct identification of Sloan-Snellen test letters viewed as bright letters against a dark surround. Four letter sizes were used corresponding to 20/60 to 20/160 acuity. They were presented at various luminance levels from 130 mL. to 0.03 mL. Statistical analysis of the data allowed evaluation of the effects of the flash variables. Eight color-normal subjects and one protanomalous subject participated in the experiments. The difference in the results for the protanomalous subject is described. Author

N65-33411# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AMINO ACIDS OF THE BLOOD AT ACUTE RADIATION ILLNESS

M. Podil'chak, L. Kuzmenko et al 22 Jul. 1965 15 p refs Transl. into ENGLISH from Acta Biol. Med. Ger. (Germany), v. 12, no. 1, 1964 p 137–146
(FTD-TT-65-383/1+4; AD-467672)

The authors studied the changes of the amino acid content in the blood plasma of rabbits suffering from acute irradiation injuries. In the course of the irradiation disease, amino acids, above all lysine and cystine, are increased 2 to 3-fold, as compared to the controls. The increase of other amino acids, such as histidine, arginine, phenylalanine, methionine and valine, was less marked. At the climax of the irradiation disease, the increase of the above amino acids proved to be most obvious. At the same time, a certain lessening of tyrosine and phenylalanine was observed during the acute irradiation disease. The authors believe that the increase of most of the examined amino acids of the blood is due to a deficiency of protein and of the negative nitrogen metabolism of an irradiated organism as a result of a disintegration of proteins in certain organs and tissues, whereby a number of amino acids in the blood are increased. Author

N65-33429# Joint Publications Research Service, Washington, D. C.
STUDIES IN NEUROHUMORAL MECHANISMS OF REGULATION OF MUSCULAR ACTIVITY
M. M. Gromakovskaya 13 Sep. 1965 19 p refs Transl. into ENGLISH of the Conclusion and Table of Contents from the book "Neyro-Gumoral'n. Mekhanizmy Regulyatsii Myshechnoy Deyatel'nosti" Moscow, Acad. of Sci., 1965 p 186–201 and p 233–234
(JPRS-31968; TT-65-32462) CFSTI: $1.00

Conclusions and a bibliography are presented of a book dealing with the relationship between nervous and humoral processes and studies of neurohumoral regulation of muscular activity. Results of experiments indicate that physiologically active substances are formed in brain tissue, whether at rest or excited, and these substances enter the blood and effect neuromuscular function. The existence of humoral mechanisms participating in central nervous influences on the neuromuscular apparatus is said to be clearly revealed by disrupting the nerve connections of muscles with the CNS. Differences between vertebral canal and interperitoneal injections of serotonin and histamine upon reflex excitability of the vagus center were noted; and results obtained with rats are graphed. Serotonin and low molecular substances of organic nature are said to give brain tissue extracts their stimulating properties. M.W.R.

N65-33430# Joint Publications Research Service, Washington, D. C.
PHYSICO-CHEMICAL BASIS OF BIOELECTRIC POTENTIALS
B. N. Tarusov and A. M. Sinyukhin, ed. 13 Sep. 1965 368 p Transl. into ENGLISH of Tr. Mosk. Obshchestva Ispytatelei Prirody, Tom IX, Otd. Biol. Sekts. Biofiziki i Radiobiologii (Moscow), 5–9 Jun. 1961
(JPRS-31971; TT-65-32465) CFSTI: $7.00

Reports on cell permeability and the physico-chemical basis of the biopotentials, their origin, excitation, and flow were presented at the symposium. These included papers on cell permeability and the distribution of matter between the cell and the medium; results of studies on the mechanism of the origination of the rest and action potentials, and the relation of the biopotentials with the metabolic processes in the animal and plant organism; and discussions on questions of excitation and flow in the biophysical light. M.G.J.

N65-33435# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SOME FACTORS INFLUENCING HUMAN RESPONSE TO AIRCRAFT NOISE: MASKING OF SPEECH AND VARIABILITY OF SUBJECTIVE JUDGMENTS
K. D. Kryter and C. E. Williams Jun. 1965 70 p refs
(Contract FA-64-WA-4951)
(FAA-ADS-42)

Statistics of the variability of subjective judgments of the loudness and noisiness of pure tones and complex sounds as studied in the laboratory and in the field are presented. Possible contributions to variability of judgments due to differences in the size of the external ear and the thresholds of auditory sensitivity at different sound frequencies for different age groups are discussed. Word intelligibility tests at various intensity levels were administered to a crew of trained listeners in the presence of recorded noise from jet and propeller-driven aircraft. Methods of measuring or evaluating aircraft noise predict the results of the speech tests in the following order of merit, from best to worst: (1) Articulation Index (AI); (2) and (3) perceived noise level in PNdB and Speech Interference Level (SIL) (SIL and PNdB appear to predict the masking of speech about equally well); (4) Noise Criteria (NC); (5) overall SPL, A scale; and (6) overall sound pressure level, C scale. Author

N65-33459# Republic Aviation Corp., Farmingdale, N. Y. Space Environment and Life Sciences Lab.
COLLECTION AND ANALYSIS PROCEDURES FOR PHYSIOLOGICAL DATA: METHODOLOGY AND APPARATUS Final Report
J. M. Peters, Irving Axelrod, G. A. Albright Port Washington, N. Y., Naval Training Device Center, 18 May 1965 27 p
(Contract N61339-1444)
(NAVTRADEVCEN-1444-1; AD-619284)

A technique for collecting, storing and analyzing physiological data is presented with a discussion of the apparatus involved. The technique permits straightforward correlation of psychomotor with physiological data. Author

N65-33479# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
THE THRESHOLD OF VISUAL SENSATION IN COMPARISON WITH THAT OF PHOTODETECTORS, ITS QUANTUM ASPECT, PROBLEMS OF COLOR PERCEPTION, AND RELATED SUBJECTS
Radames K. H. Gebel Apr. 1964 77 p refs
(AD-611401) GPO: $1.75

The threshold of the human eye is investigated statistically, and the effective spectral quantum efficiency of the eye is compared with that of technical devices employing opto-electronic photoemissive image detection by the present state of the art. Presented are data on: the physical mechanism of vision; the spectral relationship between the lumen and quanta flux; the efficiency of the human eye in comparison with that of artificial photodetectors; lumen relationship and spectral distribution of quanta flux of polychromatic sources; and color perception and related problems. To provide an easier comprehension of the statictical problems and limitations, conventional light flux and energy units are converted into dimensions directly expressing the number of quanta involved. Included in the text are tables, equations, and graphs. S.C.W.

N65-33537*# Public Health Service, Cincinnati, Ohio. Div. of Environmental Engineering and Food Protection
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS First Quarterly Progress Report, 1 Apr.–30 Jun. 1965

Robert Angelotti Jul. 1965 17 p refs
(NASA Order R-36-015-001)
(NASA-CR-64834) CFSTI: HC $1.00/MF $0.50 CSCL 06A

Several batches of *Bacillus globigii* spores have been produced. Several plating media were compared to determine their ability to permit germination and good outgrowth of *B. globigii* spores. Tryptone glucose extract agar was selected as the medium of choice as a result of these comparisons. Prototype models of two pieces of apparatus designed to reduce solids to particle sizes in the range of 5 to 50 microns have been developed, and their operational characteristics are being evaluated to determine their compatability with microbiological requirements. The effects of acetone, silicon carbide grinding papers and powders, and aluminum oxide grinding powders on the growth of *Bacillus globigii* spores was determined. Silicon carbide grinding paper (grit size 320) exhibited some inhibitory properties whereas similar papers of grit sizes 220 and 400 did not. No inhibition of growth was noted after storage of *B. globigii* spores in acetone for 72 hours or when they were plated in media made with water that had been used to leach silicon carbide and aluminum oxide powders. Author

N65-33542*# Texas Inst. for Rehabilitation and Research, Houston.
THE EFFECT OF BEDREST ON VARIOUS PARAMETERS OF PHYSIOLOGICAL FUNCTION. PART V: DIETARY REQUIREMENTS
M. Walters, C. Vallbona, D. Cardus, F. B. Vogt, and W. A. Spencer Washington, NASA, Sep. 1965 21 p refs
(Contract NAS9-1461)
(NASA-CR-175) CFSTI: HC $1.00/MF $0.50 CSCL 06S

This report presents data of the nutritional intake of thirteen subjects who participated in studies of the effect of short-term (3 days) and prolonged (14 days) bedrest. Two types of diets were used. One diet consisted of a 2 day cycle menu of fresh foods. The other consisted of three different menus of freeze-dried foods provided by the Food Research Division of the National Aeronautics and Space Administration. This offset the advantages of easy preparation of the freeze-dried meals and the small storage requirements of the packaged foods. The composition of the diets in terms of caloric, calcium, and nitrogen contents remained nearly constant throughout the studies. Prolonged bedrest did not produce a significant change in weight, but bedrest accompanied with isometric exercises resulted in a loss of weight in the majority of the subjects. There was no evidence of constipating effect of the low-residue diet provided by the freeze-dried foods. Author

N65-33554 Goodyear Aerospace Corp., Litchfield Park, Ariz.
VARIABLES INFLUENCING IMAGE INTERPRETATION PERFORMANCE IN MANNED SPACE SURVEILLANCE SYSTEMS
P. E. Resta *In* Mich. Univ. Proc. of the 3d Symp. on Remote Sensing of Environment Feb. 1965 p 63-69 refs (See N65-33550 22-13)

Successful human performance of a surveillance mission in manned orbital space systems requires intensified research on the variables which influence the detection, identification and interpretation of targets on remote sensor displays. The human operator, display, target, and vehicular variables which relate to image interpretation performance in a space environment are reviewed and inadequacies of current data regarding interacting effects of variables are discussed. Author

N65-33589 Michigan Univ., Ann Arbor.
POTENTIAL APPLICATIONS OF REMOTE SENSING TO ECOLOGICAL RESEARCH
Charles F. Cooper *In its* Proc. of the 3d Symp. on Remote Sensing of Environment, Feb. 1965 p 601-606 refs (See N65-33550 22-13)

Field investigations of the behavior of natural plant communities require knowledge of physical and biological characteristics integrated over areas of a few square feet to several square miles. Important properties potentially measurable by remote sensing techniques, singly or in combination, include leaf area, volume, weight, and chlorophyll content of vegetation; heat budgets of vegetated surfaces; qualitative and quantitative local differences in water vapor and carbon dioxide fluxes; water content of soils and vegetation; and depth and density of snow. Some implications of these measurements for understanding of ecological processes are discussed. Close collaboration between instrumentation engineers and field biologists is essential if best results are to be obtained. Author

N65-33623# General Technologies Corp., Alexandria, Va.
IDENTIFICATION AND ANALYSIS OF POSTATTACK EXPOSURE CONTROL COUNTERMEASURES Final Report
H. M. Childers and H. S. Jacobs 15 Jun. 1964 57 p refs
(Contract OCD-PS-64-15)
(GTC-54-63-64; AD-460968)

An identification and analysis of postattack, exposure control countermeasures (except decontamination) are given relative to various postattack conditions. These countermeasures were found to fall into four general categories: control of population movement in fallout radiation fields, use of shielding for exposure control, control of radioactive material ingestion, and use of medical or chemical aids to counteract or control exposure. The analysis is concentrated on the first two categories. The interdependence of population control and shielding utilization appeared quite significant, and it was found that by controlling the size and configuration of a group of people an effective means of increasing the shielding afforded to all members is obtained. The analysis showed that the use of random mixing of the group members is always advantageous when the total accumulated dose is less than the mean value of the injury criteria. In all cases, close interval formations are superior to standard distance interval formation. C.T.C.

N65-33628* Yeshiva Univ., New York. Albert Einstein Coll. of Medicine.
SENSORY, PERCEPTUAL, AND PHYSIOLOGICAL ASPECTS OF SENSORY DEPRIVATION
Sidney Weinstein *In* Va. Polytech. Inst. Role of Simulation in Space Technol., Pt. D [1964] 25 p refs (See N65-33625 22-32)
(GRANT NsG-489)

The effects of sensory deprivation and their implications for space travel are discussed. Some of the more frequently used terms for sensory deprivation are defined, and a number of studies concerned with spatial disorientation, autokinetic effects, and size constance changes are presented. A study program to determine the lowest levels of impairment which may be responsible for the deficits obtained in sensory deprivation is outlined. It was demonstrated that informational feedback is of major importance for the achievement of visual adaptation. G.G.

N65-33629* National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF LOW-GRAVITY ON PHYSIOLOGICAL PROCESSES
Siegfried J. Gerathewohl *In* Va. Polytech. Inst. Role of Simulation in Space Technol., Pt. D [1964] 36 p refs (See N65-33625 22-32) CFSTI: HC $6.00/MF $1.25

The major problems involved in low-gravity experimentation with physiological systems are discussed, and available data of the effects of low-gravity states on physiological functions during or after orbital flights are evaluated in some detail. Although some neurophysiological and physiological functions of space fliers were affected by zero-G conditions, a certain adaptation of the major vital functions to the weightless condition was observed. Clinical and medical data obtained through postflight examinations showed generalized stress responses of the central nervous system, the cardiovascular system, and the metabolic system. The observed physiological disturbances of orthostatic hypotension, cardiovascular deconditioning, and demineralization of the body, receded after a few days and later disappeared completely. These occurrences of disturbances after relatively short flight durations, and their apparent dependence on the length of the low-gravity period, are of concern in future long-term mission planning. G.G.

N65-33630* Naval Air Development Center, Johnsville, Pa.
EFFECTS OF HIGH-GRAVITY ON PHYSIOLOGICAL PERFORMANCE
Randall M. Chambers *In* Va. Polytech. Inst. Role of Simulation in Space Technol., Pt. D [1964] 71 p refs (See N65-33625 22-32) CFSTI: HC $6.00/MF $1.25

The effects of high gravity on the physiological and psychological performance capabilities of man are summarized, and some of the major simulation studies on these aspects are reviewed. Physiological tolerance to high gravity evolved as a function of many variables. The type of G-protection used had a very important influence on the pilot's ability to tolerate acceleration, perform tasks, and maintain proficiency during acceleration stress. Most pronounced disturbances in all types of high acceleration occurred from shifts in the availability of arterial blood to the retina and resulted in visual disturbances. Other expressions of disturbances were: illusions of motion and position, lowered ability to sense changes in control characteristics, difficulties to perform tasks, reduced performance of the higher mental functions, and occurrences of emotional processes. G.G.

N65-33631* Republic Aviation Corp., Farmingdale, N. Y.
CLOSED ATMOSPHERES
George A. Albright *In* Va. Polytech. Inst. Role of Simulation in Space Technol., Pt. D [1964] 64 p refs (See N65-33625 22-32) CFSTI: HC $6.00/MF $1.25

The current state-of-the-art of ground-based simulation to check out life support systems for contaminants, and to establish their biological significance is evaluated. Observed environmental stresses or factors, from launch to reentry and return to earth from orbit, consist of weightlessness, dynamic factors, ionizing radiation, cabin atmosphere, contaminants, thermal environment, circadian rhythms, and psychological factors. The complexity of future life support systems for longer space missions that must integrate food, water, and waste management, in addition to atmospheric and thermal control, is briefly outlined. G.G.

N65-33677# School of Aerospace Medicine, Brooks AFB, Tex.
A SELF-POSITIONING DEVICE FOR THE COLLECTION OF PAROTID FLUID FROM ISOLATED HUMAN SUBJECTS
Ira L. Shannon and James M. Terry Feb. 1964 8 p refs
(SAM-TDR-64-8; AD-433077)

A conventional metal cap for collecting parotid fluid has been fused to an acrylic biteblock to provide a device that can be quickly positioned and removed by the subject. This not only prevents cap dislodgment during sampling but also makes self-sampling possible in subjects who are exposed to long periods of isolation. Author

N65-33678# School of Aerospace Medicine, Brooks AFB, Tex.
TELUS (TELEMETRIC UNIVERSAL SENSOR)
William G. Glenn, Wesley E. Prather, and Heinz A. Jaeger May 1965 11 p refs
(SAM-TR-65-1; AD-468375)

There was need for a flexible complex of receiving and evaluating instruments for sensing physiologic and biologic analyses performed remotely by various field transducers. This need has been met by the design and development of TELUS (Telemetric Universal Sensor), a one-man laboratory console capable of receiving, quantitating, comparing, coding, storing, searching, retrieving, and distributing electrical and electromagnetic data. These data are received and distributed by radio and telephone. Field tests of TELUS indicate good performance characteristics for evaluating four channels of telemetered data and providing two-way communication between the laboratory and remote testing areas. Author

N65-33679# School of Aerospace Medicine, Brooks AFB, Tex.
THE EFFECT OF MASSIVE DOSES OF 32-MEV PROTONS AND CO^{60} GAMMA RADIATION ON SERUM ENZYME LEVELS OF WHOLE-BODY IRRADIATED PRIMATES
Glenn V. Dalrymple, Ian R. Lindsay, John J. Ghidoni, Harold L. Kundel, and Edwin T. Still May 1965 11 p refs
(SAM-TR-65-22; AD-468642)

Previous studies with 2-Mev x-irradiated primates have shown that significant elevation of serum lactic dehydrogenase (LDH) levels occurs after irradiation but that flutamic oxalacetic transaminase (SGOT) levels are essentially unchanged. In the present study, massive doses (6,500 to 6,700 rads) of 32-Mev protons and Co^{60} gamma radiation were given to primates (*Macaca mulatta*). Marked elevation of the serum levels of both of these enzymes occurred during the postirradiation period. Author

N65-33711*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VARIATIONS IN INTRAUTERINE pH WITHIN A CIRCADIAN RHYTHM (GALLUS DOMESTICUS)
C. M. Winget, C. A. Mepham, and E. G. Averkin [1964] 26 p refs Submitted for Publication
(NASA-TM-X-51875) CFSTI: HC $2.00/MF $0.50 CSCL 06P

Data from Gallus Domesticus are presented showing the relationship between uterine pH and time post-oviposition. The data suggest that uterine pH is associated with certain periods of uterine activity. A Fourier analysis, a periodogram, and a correlogram all indicate a cyclic phenomenon; furthermore, the correlogram indicates the pH cycle to be endodiurnal. Author

N65-33714*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
HOW TO SEE YOUR OWN FOVEA
J. Y. Lettvin and Samy Frenk [1964] 2 p Submitted for Publication
(Grants NsG-496; NSF GP-2495; NIH-G-MH-04737-04; Contracts DA-36-039-AMC-03200(E); AF 33(615)-1747)
(NASA-CR-58190) CFSTI: HC $1.00/MF $0.50 CSCL 06D

A procedure involving motion of a light directed at the closed human eye is described which makes it possible for the subject to view the cellular elements overlying the cones in his own retina. J.M.D.

N65-33738# School of Aerospace Medicine, Brooks AFB, Tex.
SMALL ANIMAL CENTRIFUGE FOR CHRONIC ACCELERATION STUDIES

Julian P. Cooke and Richard W. Bancroft May 1965 8 p refs (SAM-TR-65-23; AD-468376)

A description is given of the construction and operation of a small animal centrifuge that has been devised especially for carrying out long-term, uninterrupted exposures to increased gravity fields. A nomogram is presented for ascertaining the effective gravity forces (g_E) in such a centrifuge in which suspended animal cages are allowed to align with vectorial forces. Author

N65-33752# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE DOCTOR PROPOSES, THE PHYSIOLOGIST INVESTIGATES AND THE CONSTRUCTOR CREATES

L. Kokin 15 Apr. 1965 20 p Transl. into ENGLISH from Nauka i Zhizn' (Moscow), no. 3, 1964 p 82–89 (FTD-TT-64-1089/1+2; AD-614946)

The development and descriptions of various bioinstruments for application to aerospace medicine are presented. These instruments include a cardiophone, a vector cardioscope, an electrocardiogram simulator, an intercom system for barometric chamber tests, and an electron voltage stabilization system. R.N.A.

N65-33755# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDYING ALBUMIN FRACTIONS OF THE BLOOD BY THE ELECTROPHORESIS METHOD OF CHRONIC MOUTH DISEASES

P. N. Andrianov 22 Jul. 1965 9 p Transl. into ENGLISH from Stomarologiya, (Moscow), no. 3, 1963 p 29–33 (FTD-TT-530/1+4; AD-618899)

The examined patients showed an increase in globulin content and reduction in albumin. This displacement becomes more pronounced with the duration of the illness, and with the rise in the histamine level of the blood serum. Repeated examination of patients after therapy showed that the state of albumin fractions improved, histamine level decreased, and general condition improved. TAB

N65-33767# George Washington Univ., Washington, D. C. Human Resources Research Office.

CONTROLLING THE QUALITY OF TRAINING

Robert G. Smith, Jr. Jun. 1965 48 p refs (Contract DA-44-188-ARO-2) (TR-65-6; AD-618737)

The need for a quality control system in a military training program and methods of establishing such a unit are described and evaluated in this report, which is part of a research project in the technology for developing training. It is stated that the purpose of quality control is to ensure a satisfactory standard of competence among the students who graduate, to maintain this quality by a continuous monitoring process, and to improve training where it is found to be deficient. In order to function successfully, a quality control system should constitute a separate unit, independent of but cooperating with the instructional departments. Attention is given to proficiency testing as the chief means of measuring the success of the training program, with emphasis upon the importance of a uniform standard and consistent method in the preparation, administration, and scoring of tests. Author

N65-33801*# National Aeronautics and Space Administration, Washington, D. C.

RESULTS OF SOME MEDICAL INVESTIGATIONS ON THE SPACECRAFT VOSKHOD AND VOSKHOD 2 [REZUL'TATY NEKOTORYKH MEDITSINSKIKH ISSLEOVANIY NA KOSMICHESKIKH KORABLYAKH "VOSKHOD" I "VOSKHOD-2"]

O. G. Gazenko and A. A. Gyurdzhian May 1965 10 p Transl. into ENGLISH from RUSSIAN Presented at the 2d Ann. Meeting of the Am. Astronautics Soc., Chicago, 4–7 May 1965 (NASA-TT-F-9539) CFSTI: HC $1.00/MF $0.50 CSCL 06P

The report presents the results of some medical (chiefly physiological) investigations carried out during flights on the spacecraft Voskhod and Voskhod 2 which, according to the authors, amy be of interest in connection with the outlook for space travel, including manned flight to the moon. Author

N65-33806*# National Aeronautics and Space Administration, Washington, D. C.

POSSIBLE CARDIAC BEHAVIOR IN THE ABSENCE OF GRAVITY

Saul Kullock, Curt Mayer, and Samuel Kullok Sep. 1965 25 p refs Transl. into ENGLISH of "Sobre la Posible Conducta del Corazon en Ausencia de un Campo de Fuerzas Gravitatorias" (Buenos Aires), 1965 p 1–14 (NASA-TT-F-9562) CFSTI: HC $1.00/MF $0.50 CSCL 06P

The authors study the oxygen cardiac-energy equilibrium under various conditions. Methods for preventing and correcting cardiac deterioration in the absence of gravity are discussed. Author

N65-33809*# National Aeronautics and Space Administrstion, Washington, D. C.

A METHOD OF STUDYING THE AORTA BY DETERMINING THE SPEED OF PROPAGATION OF PULSE WAVES [K METODIKE ISSLEDOVANIYA AORTY OPREDELENIYEM SKOROSTI RASPROSTRANENIYA PUL'SOVOY VOLNY]

N. D. Reznik Oct. 1959 12 p refs Transl. into ENGLISH from Kardiologiya (Moscow), v. 3, 1963 p 78–81 (NASA-TT-F-9569) CFSTI: HC $1.00/MF $0.50 CSCL 06P

A method using simple equipment is presented for determining pulse wave velocity from pulse curve lag behind EKG. Pulse curve recording improves and pulse wave propagation time in the proximal segment of the aorta can be estimated. Comparison of propagation times reveals an atherosclerotic pathognomic ratio. Age changes have little and functional changes have no effect on the ratio. Author

N65-33830*# National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY—A CONTINUING BIBLIOGRAPHY, JULY 1965

Aug. 1965 143 p refs (NASA-SP-7011(14)) CFSTI: HC $1.00/MF $1.00 CSCL 06E

An annotated bibliography is presented on aerospace medicine and biology. References are included on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space; similar effects on biological organisms of lower order; and related topics such as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors. R.N.A.

N65-33855*# Naval School of Aviation Medicine, Pensacola, Fla.

RESIDUAL EFFECTS OF STORM CONDITIONS AT SEA UPON THE POSTURAL EQUILIBRIUM FUNCTIONING OF VESTIBULAR NORMAL AND VESTIBULAR DEFECTIVE HUMAN SUBJECTS

Alfred R. Fregly and Ashton Graybiel 2 Jul. 1965 19 p refs Prepared jointly with NASA *Its* Rept.-115
(NASA Order R-93)
(NASA-CR-64935; NSAM-935) CFSTI: HC $1.00/MF $0.50 CSCL 06P

The residual effects of storm conditions at sea upon postural equilibrium functioning have not been studied objectively. As a part of a larger study, the opportunity was taken to investigate by means of a new quantitative ataxia test battery differences between vestibular normals (N=20) and labyrinthine defective (L-D) human subjects (N=9). Following a highly stressful sea experience, during which bizarre stimulation of the vestibular apparatus was amply provided, the L-D group maintained or improved their baseline postural equilibrium test performance scores. The ten initially poorest scoring normals as a subgroup were found free of postural decrement in contrast with significant performance decrements observed in the initially highest scoring subgroup of normals. Probable influences over differential results within the normals and between groups as well as differential test findings are discussed. Author

N65-33865*# Naval School of Aviation Medicine, Pensacola, Fla.
TISSUE DOSAGES FROM ALPHA PARTICLES AND HEAVY NUCLEI IN SOLAR PARTICLE BEAMS IN SPACE
Hermann J. Schaefer 17 Jun. 1965 15 p refs Prepared jointly with NASA *Its* Rept-32
(NASA Order R-75)
(NASA-CR-64997; NSAM-933) CFSTI: HC $1.00/MF $0.50 CSCL 06R

Recordings of several large flare events indicate that solar particle beams contain, in addition to H and He, also heavy nuclei. For the November 13, 1960 flare in particular, complete rigidity spectra for H and He and C, N, O, F nuclei have been reported. Evaluation of these spectra in terms of tissue depth doses behind 0.1 g/cm^2 shielding shows that, while the He component contributes substantially to exposure in near-surface regions, the dose function of the medium heavy component remains, even in the tissue surface, on the level of a few percent. In view of the smallness of this contribution, it seems unnecessary to extend the spectral resolution of LET sensors up to the Bragg peaks of medium heavy nuclei (1000 kev/micron T). Author

N65-33921*# Naval School of Aviation Medicine, Pensacola, Fla.
SYMPTOMATOLOGY UNDER STORM CONDITIONS IN THE NORTH ATLANTIC IN CONTROL SUBJECTS AND IN PERSONS WITH BILATERAL LABYRINTHINE DEFECTS
Robert S. Kennedy, Ashton Graybiel, Robert C. Mc Donough, and Frederick D. Beckwith 25 May 1965 15 p refs
(NASA Order R-93)
(NASA-CR-64879; NSAM-928) CFSTI: HC $1.00/MF $0.50 CSCL 06P

Ten labrinthine defective (L-D) and twenty normal subjects were exposed to extremely severe weather conditions during a sea voyage. The effects of such a stress were complicated by a feeling of fear in all of the normal and in some of the L-D subjects. None of the latter manifested typical symptoms of motion sickness whereas all of the normal subjects did. The fact that the L-D subjects did not become sick suggests that, even in instances where motion sickness symptoms appear to be triggered by anxiety, the vestibular organs play an essential etiological role. Author

N65-33950*# National Aeronautics and Space Administration, Washington, D. C.
AVIATION MEDICINE
A. A. Lavnikov Sep. 1965 251 p refs Transl. into ENGLISH of the book "Aviats. Med." Moscow, Voyenizdat, 1961
(NASA-TT-F-8403) CFSTI: HC $6.00/MF $1.50 CSCL 06E

A Soviet manual on anatomical, hygienic, and physiological problems in aviation is presented which is addressed to aviation personnel. This textbook is of interest primarily for evaluation of Soviet Air Force personnel training and the presentation of popular ideas concerning passive defense against nuclear attack. J.M.D.

N65-33951*# National Aeronautics and Space Administration, Washington, D. C.
SYNTHETIC ELECTROCARDIOLOGY
Z. L. Dolabchyan Jan 1965 402 p refs Transl. into ENGLISH of the book "Sintetich. Elektrokardiologiya" Yerevan, Armenian SSR Acad. of Sci. Publishing House, 1963
(NASA-TR-F-9459) CFSTI: HC $7.00/MF $2.00 CSCL 06P

The author, on the basis of his own experience in a modern cardiological clinic using electrophysiological and biophysical methods of heart study, approaches these methods from a single viewpoint. This is accomplished by passing from the analytic examination of each investigative method to a synthesis of all these methods. In this work, the questions pertaining to modern clinical electrocardiology are investigated on the basis of a synthetic principle. This monograph is, in fact, a first attempt at defining clinical electrocardiology as a separate branch of cardiology. The book is intended for electrocardiologists, practicing physicians, surgeons, and physiologists working in the domain of clinical and experimental cardiology. There is a concise English annotation at the end of the book. Author

N65-33958*# National Aeronautics and Space Administration, Washington, D. C.
SOME PROBLEMS IN ECOLOGICAL PHYSIOLOGY
N. M. Sisakyan Sep. 1965 14 p Transl. into ENGLISH of "Nekotoryye Problemy Ekofiziologii", Akad. Nauk SSSR (Moscow)
(NASA-TT-F-9545) CFSTI: HC $1.00/MF $0.50 CSCL 06P

The author enumerates some problems of space physiology still to be solved. Comprehensive study of the effect of environmental factors and their actions has led to the formulation of ideas on physiological methods of increasing the resistance of man, and to the recommendation of techniques for protection of man against injurious environment factors. Author

N65-33972*# American Inst. for Research, Pittsburgh, Pa.
THE ROLE OF HUMAN FACTORS TASK DATA IN AEROSPACE SYSTEM DESIGN AND DEVELOPMENT Technical Report, 15 Jun. 1964–15 Feb. 1965
L. Duncan Hannah, John A. Boldovici, James W. Altman, and Raymond C. Manion Wright-Patterson AFB, Ohio, AMRL, Aug. 1965 96 p refs
(Contracts NASr-194; AF 33(615)-1557)
(NASA-CR-67080; AMRL-TR-65-131) CFSTI: HC $3.00/MF $0.75 CSCL 05E

On the basis of information gathered from generators and users of human factors task data by both interviews and questionnaires and by a review of relevant literature, human factors personnel and data were identified, the relations between them described, and recommendations for an automated human factors task data handling system proposed. Human factors personnel were clearly divisible into four hierarchically arranged groups: Program Level Managers, Personnel Subsystem Managers, Department Heads, and Nonmanagerial Personnel. In general, and for the populations described, managers or supervisors were the

principal users and nonmanagerial personnel the principal generators of human factors data. A framework that permits classification of both formatted and unformatted data was proposed as responsive to the generally felt need by data generators and users for more orderly "book-keeping" in the human factors realm. Desirable characteristics of an automated human factors task data handling system were derived from the questionnaire responses. Author

N65-33981# Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine.
THE EQUIDISTANCE TENDENCY AND ITS CONSEQUENCES: PROBLEMS IN DEPTH PERCEPTION
Walter C. Gogel Apr. 1965 16 p refs
(AM-65-11)

The equidistance tendency is the tendency for objects or other inhomogeneities in the field-of-view to appear at the same distance as each other with the strength of this tendency being inversely related to directional separation. The evidence for the existence of the equidistance tendency and for its ability to modify the perceived depth resulting from size or stereoscopic cues is reviewed. The equidistance tendency is discussed as a disturbing factor in visual experimentation and as a necessary factor in the understanding of Emmert's law, the moon illusion, and similar phenomena. Several possible explanations for the equidistance tendency are evaluated in terms of the range of phenomena with which it is identified. Author

N65-33991# Brookhaven National Lab., Upton, N. Y.
MECHANISM OF THE IMMUNE RESPONSE Brookhaven Lecture Series No. 42, Dec. 1964
Marian Elliott Koshland Aug. 1965 20 p refs
(BNL-912 (T-374)) CFSTI: $1.00

The mechanism of the human body's immune response when a foreign substances gains entrance to the tissues is discussed. Some of the classic examples of pathogenic viruses, bacteria, and bacterial products, as well as examples of the many foreign substances other than invading microorganism are listed. The sequence of events describing the cellular reaction when an individual has his first contact with a foreign substance is outlined, and the physicochemical properties and structure of antibody in general are presented. Reexamination of the amino acid composition of several rabbit antibodies established an over-all similarity of the compositions, and also the appearance of a few small but significant differences. It was concluded that antibody synthesis is directed by information contained in the genetic apparatus of the cell. G.G.

N65-34001*# United Aircraft Corp., Windsor Locks, Conn. Space and Life Systems Dept.
MEDICAL AND BIOLOGICAL APPLICATIONS OF SPACE TELEMETRY Technology Utilization Report
Washington, NASA, Jul. 1965 70 p refs Sponsored by NASA
(NASA-SP-5023) GPO: $0.45; CFSTI: MF $0.75 CSCL 06B

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N65-34002* Cox Coronary Heart Inst., Dayton, Ohio.
PRACTICAL PROBLEMS OF USING TELEMETRY IN INTENSIVE-CARE WARDS
G. Douglas Talbott *In* United Aircraft Corp., Windsor Locks, Conn. Med. and Biol. Appl. of Space Telemetry Jul. 1965 p 5–10 refs (See N65-34001 22-04) GPO: $0.45; CFSTI: MF $0.75

The place of telemetry in intensive-care wards is assured. By means of telemetry, the status of the acutely ill patient can be constantly monitored and assessed. The introduction of this technology into clinical medicine will force increasing attention to the problems of "processing" the data so that ward personnel are not overwhelmed by the output of the system. The use of telemetry at the Cox Coronary Institute is discussed in this chapter. Author

N65-34003* United Aircraft Corp., Windsor Locks, Conn.
TELEMETRY IN SURGERY AND ANESTHESIOLOGY
M. S. Molnar *In its* Med. and Biol. Appl. of Space Telemetry Jul. 1965 p 11–15 (See N65-34001 22-04) GPO: $0.45; CFSTI: MF $0.75

Something of a delemma has been created in surgery. Research and advanced techniques now allow surgery in many marginal situations previously considered hopeless. In these cases, the surgeon and anesthesiologist are pressed to keep sufficiently informed of the patient's condition. Continuous monitoring and warning signals provided by biotelemetry are of ever increasing assistance. The synthetic environment common to astronautics and surgery may be the key to improved interchange of knowledge between these areas. This chapter examines reasons for the recent change in surgical monitoring techniques, showing the role that technological advancement in nonmedical fields has played in bringing about the change. It relates the impact that space technology in particular has had and may have on the methods used to telemeter patient conditions during surgery. To discover some of the advances in surgical and anesthetic practices which may arise from space age technology, the need for improved patient monitoring is outlined, and the history of surgical monitoring systems is traced. Author

N65-34004* United Aircraft Corp., Windsor Locks, Conn. Hamilton Standard Div.
DIAGNOSTIC MONITORING IN OFFICE PROCEDURE
P. R. Amlinger *In its* Med. and Biol. Appl. of Space Telemetry Jun. 1965 p 17–21 (See N65-34001 22-04) GPO: $0.45; CFSTI: MF $0.75

Biotelemetry as the electrical transmission of biological data for the preservation of life has been classified according to its functional conditions in monitoring normal life in normal or abnormal environments and abnormal life in normal environments. However, such groupings may be overlapping. Although this chapter is concerned mainly with the observation of normal life in office procedures, where the environment can be called normal, it still requires dealing with (usually) normal life under some unusual conditions. Author

N65-34005* Stanford Univ., Calif. School of Medicine.
TELEMETRY AND TELESTIMULATION IN PSYCHOPHYSIOLOGY
B. Robinson *In* United Aircraft Corp., Windsor Locks, Conn. Med. and Biol. Appl. of Space Telemetry Jul. 1965 p 23-32 refs (See N65-34001 22-04) GPO: $0.45; CFSTI: MF $0.75

Telestimulator systems can be used in conjunction with telemetry devices so that physiological responses of subjects receiving electric stimulation of the brain can be remotely observed. Three such telestimulator-telemetry systems are discussed in this chapter. The first of these are the MARK I and II systems. The third system is under construction by the United Aircraft Corporation with support from NASA. System characteristics, psychophysiological applications, space applications, and possible medical uses for such systems are also discussed. The purpose of this chapter is to review, concisely and clearly, the techniques currently available for remote brain stimulation and recording. The emphasis will be consistently on general principles; the reader interested in the details can refer to the bibliography for access to the literature. The possible uses of these techniques will then be discussed. A large part of this chapter is frankly speculative and projects into the future, for the field is barely newborn. Yet, in an age when the future is barely realized before becoming obsolete, such a projection may have its justification. Author

N65-34006* United Aircraft Corp., Windsor Locks, Conn. Hamilton Standard Div.
TELEMETRY SYSTEMS—REDUCTION TO PRACTICE
P. R. Amlinger and M. L. Hanson *In its* Med. and Biol. Appl. of Space Telemetry Jul. 1965 p 33-51 (See N65-34001 22-04) GPO: $0.45; CFSTI: MF $0.75

Biotelemetry is being adopted because there are requirements for measuring more parameters with less patient interference. Equipment designers look to microminiaturization for reduced size, lower power, and increased reliability. This new method of designing circuits will lead to better devices. But with each improvement will come the demand for still better units. Author

N65-34020# Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine.
PILOT FATIGUE: INTERNATIONAL JET FLIGHT. 1: OKLAHOMA CITY—TOKYO
George T. Hauty and Thomas Adams Mar. 1965 25 p refs (AM-65-16)

Following 3 consecutive days of biomedical assessment in Oklahoma City, six healthy subjects were transported to Tokyo, where assessments were made on alternate days throughout a period of 10 days, and were then transported back to Oklahoma City, where assessments were made for 3 consecutive days. Based upon the single parameter of rectal temperatures, the mean values of all subjects revealed that biological time had apparently shifted from Oklahoma City to Tokyo time within 3 days and from Tokyo back to Oklahoma City time within 1 day. Individual rectal temperature curves of the different subjects, however, revealed a profound range of individual differences. The mean proficiency with which the subjects executed basic task functions was adversely affected to a substantial extent during the first day in Tokyo and, to a lesser extent, the first day of return to Oklahoma City. Author

N65-34068# Florida Univ., Gainsville. Dept. of Physiology.
HYPOXIC LACTACIDEMIA: ITS PREVENTION WITH HEPARIN
Edward Otey Brooks AFB, Tex., School of Aerospace Med., Dec. 1964 13 p refs Submitted for Publication
(Contract AF 41(609)-1553)
(SAM-TR-64-78; AD-457902)

Thirteen anesthetized dogs were treated with heparin (5 to 7 mg./kg.), and 10 were treated with another anticoagulant (Mepesulfate, 50 mg./kg.). All breathed low oxygen gas mixtures after a control period during which they breathed air. Lactic acid and excess lactate in arterial blood increased in an almost linear fashion in the animals given Mepesulfate, but no increase in either substance was seen in heparin-treated animals. These results indicated that a re-evaluation of the role heparin plays in physiologic functions is necessary. Author

N65-34102# Joint Publications Research Service, Washington, D. C.
REGULATIONS PERTAINING TO WORK WITH IONIZING RADIATION SOURCES
14 Sep. 1965 25 p Transl. into ENGLISH from Sluzbeni List SFRJ (Belgrade), no. 31, 14 Jul. 1965 p 1198-1205 (JPRS-31993; TT-65-32487) CFSTI: $1.00

The regulations for handling radioactivity in Yugoslavia are presented. These include: (1) The health conditions and physical examination requirements for persons who work with ionizing radiation sources. (2) The maximum permissible doses of ionizing radiation to which workers may be exposed. (3) The professional training requirements of persons working with ionizing radiation sources, and the protection procedures against such radiation. (4) The use of radioactive materials in excess of the maximum limits of activity, and the protective measures against radiation from such sources. W.M.R.

N65-34107# Brookhaven National Lab., Upton, N. Y.
RADIATION AND THE PATTERNS OF NATURE
George M. Woodwell 24 Mar. 1965 19 p refs *Its* Lecture Ser. No. 45 Sponsored by AEC
(BNL-924(T-381)) CFSTI: $1.00

The patterns of radiation effects on natureal communities, and the normal patterns of structure, function, and development of these communities are considered. The approach used involved the establishment of two experiments. A single large source of gamma radiation was arranged so that it could be lowered into a shield to allow safe approach to the source, or suspended several feet above the ground to provide a large radiation field. The sources were large enough to give exposures of several thousand roentgens per day within a few meters, dropping to near background levels at distances > 300 m. The two experiments were in an irradiated old field in a well-known gamma radiation field, and in a newly irradiated forest. Irradiation produced striking changes in the communities of the early successional stages. The most conspicuous change was a drastic simplification or a reduction in numbers of species per unit area or diversity. Irradiation at 1000 R/day reduced diversity to ≈ 50% as compared to the nonirradiated field 2 km distant. The forest did not share the plasticity of communities with simpler structures and, in that respect, was more sensitive to any disturbance. R.W.H.

N65-34133# California Univ., Los Angeles. Biotechnology Lab.
UPPER EXTREMITY PROSTHETICS RESEARCH, HUMAN TRACKING, SENSORY MOTOR CONTROL, MYOELECTRIC CONTROL Progress Report, Mar. 15-Jul. 15, 1965

15 Jul. 1965 20 p refs
(Contracts VA-V1005P-9779, N123(60530)32857A; AF-33(615)-1969; Grant VRA RD-1201M-64)
(Rept.-65-31; AD-619528)

Research activities are outlined for studies relating to upper extremity prosthetics, army prostheses sensory motor control problems, and analysis of prosthesis-amputee systems. Externally-powered prostheses and the utility of minor surgical alterations to body control sites for such devices are considered. Harnessing techniques for a mechano-electrical transducer to selected control sites and development of an external "logic" system with a minimum number of body control sites are discussed. Performance of human operators is considered in relation to tracking systems and to multi-dimensional myoelectric control systems. M.W.R.

N65-34134# St. Louis Univ., Mo. Dept. of Physiology.
CONTINUOUS REGISTRATION OF BODY WEIGHT Final Report, May 1963–Sep. 1964
Alrick B. Hertzman, Franz Flath, Bernell Coleman, and Louis S. D'Agrosa Wright-Patterson AFB, Ohio, AMRL, Jun. 1965 15 p refs
(Contract AF 33(657)-11551; Grants PHS-H-4939; PHS-HE-07070)
(AMRL-TR-65-23; AD-619441)

This report describes a device for continuous recording of the weight of a human subject. The frame on which the subject may either sit or lie is carried by three load cells mounted as a tripod. The electrical signals from the strain-gauges permit detection of a weight change of one gram. Insulation and heating of the load cells to a constant temperature ±0.1° C permit use of the system in the presence of rapid changes in environmental temperatures. Circuits are described for automatic regulation of load cell temperature. Author

N65-34145# Air Force Systems Command, Kirtland AFB, N. Mex. Air Force Weapons Lab.
AVERAGE RANGES AND MEANS OF BLOOD VALUES IN NEW MEXICO BRED SHEEP UNDER SPECIFIED ENVIRONMENTAL CONDITIONS Technical Report, Oct. 1963–May 1965
Norman D. Jones, Robert K. Jones, and William R. Godden Aug. 1965 28 p refs
(AFWL-TR-65-109; AD-619649)

This paper reports normal hematologic values of a large number of sheep under known and stated conditions. Seven hundred ninety-four samples from 336 Rambouillet-Columbia cross sheep 18 to 36 months of age were taken over a period of 20 months. Monthly ranges, averages, and one standard deviation are reported for erythrocytes, leucocytes, thrombocytes, differential counts, hemoglobin, hematocrit, mean corpuscular volume, and mean corpuscular hemoglobin concentration. Altitude appears to affect some of these values. Author

N65-34185# Göttingen Univ. (West Germany). Inst. for Plant Physiology.
DIAMINODUREN AS ELECTRON DONOR AND THE EFFECT OF UV-LIGHT ON PHOTOSYNTHETIC REACTIONS IN ISOLATED CHLOROPLASTS Scientific Report No. 2
A. Trebst 1 May 1965 12 p refs
(Contract AF 61(052)-716)
(AFCRL-65-550; AD-619822)

Diaminoduren reverses the DCMU-inhibition of photosynthetic NADP-reduction and therefore acts as electron donor for the electron transport chain. The DAD-system is coupled to ATP-formation and gives the best rates of all electron donor systems known so far. In UV-irradiated chloroplasts the endogenous plastoquinone is destroyed. Such chloroplasts do not evolve oxygen anymore, but are still able to photoreduce NADP at the expense of an artificial electron donor system. Cyclic photophosphorylation with PMS as cofactor is less sensitive to UV-irradiation and at a certain stage of damage of the chloroplasts becomes inhibited by antimycin; indicating a second phosphorylation site. Author

N65-34204# Library of Congress, Washington, D. C. Aerospace Technology Div.
BIOLOGICAL EFFECTS OF MICROWAVES Surveys of Soviet Scientific and Technical Literature
17 Sep. 1965 100 p Compilation of Abstracts
(ATD-P-65-68)

An annotated bibliography which was designed to review the historical development and to survey the contemporary state of Soviet and Soviet-Bloc research on the biological effects of microwaves, especially in the radio frequency ranges, is reported. Abstracts are based primarily on literature published during the period 1937 to 1965. Focused on were those articles concerned with the effects of microwaves on the central nervous system. Data are presented in the following areas: hygienic and clinical aspects of microwaves, experimental effects of microwaves, and the effects of a constant magnetic field and low-frequency electromagnetic fields on higher nervous activity. Included are discussions and reviews on biological effects, experimental methods, and mechanisms of the action of microwaves. S.C.W.

N65-34205# Brookhaven National Lab., Upton, N. Y.
1963 ENVIRONMENTAL RADIATION LEVELS AT BROOKHAVEN NATIONAL LABORATORY
A. P. Hull Nov. 1964 20 p refs
(BNL-915(T-376)) CFSTI: $1.00

Natural background and radiation levels attributable to Laboratory operations during 1963 are summarized. Record amounts of fallout, principally from the atmospheric testing of nuclear weapons by the USSR during the latter part of 1962, were also observed in many types of environmental samples, and data on fallout radioactivity levels are reported. Also included are data on external wholebody exposures, air particulate concentrations, rain and settled dust collections, milk and vegetation concentrations, and liquid effluent and offsite stream concentrations. S.C.W.

N65-34227*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
ANALYSIS OF THE EXTRATERRESTRIAL LIFE DETECTION PROBLEM
Richard S. Young, Robert B. Painter, and Richard D. Johnson Washington, NASA, 1965 36 p refs
(NASA-SP-75) CFSTI: HC $2.00/MF $0.50 CSCL 06M

Some guidelines and ground rules relating to the detection of evidences of extraterrestrial life and to the development of instrumented payloads for specific planets are considered. The attributes of life are discussed in terms of macromolecules, metabolism, and reproduction; and it is emphasized that any detection system should include experiment dealing with all these attributes. Results from chemical experiments alone, even if they indicate the existence of compounds such as proteins or nucleic acids, do not necessarily indicate the existence of life. A discussion of Mars and the problems encountered there deals with life detection sampling, optimum experimental configurations, and mission profile after landing. Sterilization problems and techniques are also considered. M.W.R.

N65-34260# School of Aerospace Medicine, Brooks AFB, Tex.
THE EFFECT OF AET ON THE IN-VITRO OXIDATION OF GLUCOSE BY RAT SPLEEN AND BONE MARROW SUSPENSIONS
Harold L. Kundel and Donald F. Logsdon, Jr. May 1965 7 p refs Submitted for Publication
(SAM-TR-65-29; AD-468463)

The effect of AET injected intraperitoneally (200 mg./kg.) and added in vitro on the oxidation of glucose by spleen cell and bone marrow suspensions has been studied. No significant effect could be demonstrated. Author

N65-34266# School of Aerospace Medicine, Brooks AFB, Tex.
EEG ELECTRODES FOR IN-FLIGHT MONITORING
Eric R. Skov and David G. Simons Apr. 1965 10 p refs
(SAM-TR-65-18; AD-468524)

An electrode is described for in-flight recording of EEG. The electrode provides significant improvement over previously available types. When properly applied, it produces little noise, even when tapped. It is resistant to accidental dislodgement and is comfortable under close-fitting headgear. The leads, a major problem source, may easily be replaced. The impedance between two electrodes is 5,000 ohms or less, permitting use with miniature transistorized amplifiers. Author

N65-34279# General Electric Co., Philadelphia, Pa. Missile and Space Div.
RESEARCH STUDY OF THE BIOMEDICAL ASPECTS OF AEROSPACE SYSTEMS ENVIRONMENTAL CHAMBER MARK I. PHASE V: STUDY OF MAN RATING, SUBSYSTEM DESIGN CRITERIA Technical Report, Jan.–Mar. 1964
R. A. Miller, S. W. Meyer, and R. Mader Arnold AF Station, Tenn., Arnold Eng. Develop. Center, Aug. 1965
(Contract AF 40(600)-1012)
(AEDC-TR-65-179, Vol. II; AD-469039)

This report presents design criteria that were evolved for certain specialized subsystems that are necessary to man rate the AEDC Mark I Aerospace Systems Environmental Chamber. Criteria were developed for the following subsystems: (1) Remote Environmental Control Systems (ECS) to sustain full pressure suited men, (2) ECS—to suit umbilicals (Preliminary), (3) ECS/Biomedical Control Console, (4) Rapid Repressurization Subsystem (Preliminary) and (5) Biomedical Facilities Special Requirements. The depth and detail of the criteria evolved during this phase of the Mark I Man Rating were limited by available funding and tight schedule requirements. Author

N65-34281# Northrop Space Labs., Hawthorne, Calif.
A LONG RANGE AND CONTINUING SEARCH FOR CHANGES IN BIOLOGICAL SYSTEMS RESULTING FROM DAMAGE INDUCED BY IONIZING RADIATIONS Formal Progress Report, 1 Nov. 1964–28 Apr. 1965
J. A. Demetriou and F. M. Maciasr 30 Apr. 1965 14 p
(Contract AF 41(609)-2679)
(NSL-65-23-1; AD-464998)

Urine collected from rats exposed to a total dose of about 805 ± 81 rads was analysed for fluorescent products by means of gel filtration. Using a 15 cm gel filtration column and water as the elutant, compounds such as vanillymandelic acid, 3-methoxy-4-hydroxy-phenyl acetic, and 3-methoxy-4-hydroxy-phenyl glycol were eluted. Utilization of sodium chloride as eluting solution resulted in the separation of ephinephrine, normetanephrine, and serotonin. Chromatography of native urine of the gel columns showed multiple sharp fluorescent peaks of proteins, and several pigmented fractions. It was concluded that the present fluorometer arrangement is not practical for obtaining a complete chromatographic profile of fluorescent fractions in the urine. G.G.

N65-34302# Autonetics, Downey, Calif.
A COMPARISON OF OPERABILITY AND READABILITY OF FOUR TYPES OF ROTARY SELECTOR SWITCHES
Peter E. Kolesnik Jun. 1965 23 p refs
(T5-1187/3111; AD-617914)

The object of this study was to compare operator performance with four types of rotary selector switches. They included a conventional fixed-scale, moving-pointer switch and three types of fixed-pointer, moving-scale designs—one exposing a single digit, one exposing three digits, and one continually exposing 10 digits. Specific parameters investigated were speed and accuracy of control positioning, and accuracy of reading under four limited exposure times. In addition, each subject ranked the four types of controls according to the degree of difficulty he encountered in using them. Results indicated that positioning performance with the fixed-scale, moving-pointer switch was significantly faster than with the three types of fixed-pointer, moving-scale switches. No practical differences were obtained among the switches for positioning errors. Nevertheless, individuals indicated subjective preference for the fixed-scale over the three types of moving-scale switches. It was concluded that moving-scale switches are superior to fixed-scale switches, where accuracy of reading is more important than speed of setting. Author

N65-34303# Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine.
ADAPTATION TO VESTIBULAR DISORIENTATION. II: NYSTAGMUS AND VERTIGO FOLLOWING HIGH-VELOCITY ANGULAR ACCELERATIONS
William E. Collins Sep. 1965 12 p refs
(AM-65-24)

Professional figure skaters who, as part of their daily routine, subject themselves to high levels of disorientation- and vertigo-producing stimuli, were given a series of laboratory tests consisting primarily of caloric irrigations and mild angular accelerations. Electronystagmographic recordings and subjective reports (turning sensations and vertigo) were obtained. Contrary to other reports, brisk vestibular responses were obtained, prompting an "on-ice" study employing telemetry of eye movements to an ENG recorder and motion pictures. Data were obtained during and following normal high-velocity spins on ice. In the absence of opportunities for visual fixation, vigorous nystagmus and disorientation occurred. Thus, even with highly trained subjects, vestibular stimulation can produce disorientation when visual cues are not present. Author

N65-34314# Rochester Univ., N. Y.
PLATELET SIZE DISTRIBUTION FOLLOWING X-IRRADIATION
R. O. Spertzel, T. J. Bucci, and M. Ingram 19 Apr. 1965 11 p Presented at the 2d Intern Congr. of Radiation Res., Harrogate, England, 5–11 Aug. 1962
(Contract W-7401-ENG-49)
(UR-663; CONF-19-5)

The effect of X-ray irradiation on blood platelet size was evaluated quantitatively. Microscopic examination of stained blood films indicates that platelet size becomes irregular in dogs during recovery from single large X-ray doses, and in men receiving low-level exposures over long periods. J.M.D.

N65-34316# California Univ., Los Angeles.
EFFECTS OF CHELATED IRON AND ZINC ON ROUGH LEMON AND TRIFOLIATE ORANGE SEEDLINGS GROWN IN CALCAREOUS AND NONCALCAREOUS SOIL

A. H. Khadr, A. Wallace, and E. M. Rommey [1964] 9 p refs
(Contract AT(11-1)-34)
(TID-20741)

Trifoliate orange seedlings were zinc deficient when grown on noncalcareous soil or calcareous soil, and they were severely injured by iron chlorosis when grown on calcareous soil. Rough lemon was not subject to these deficiencies when grown on either soil. ZnEDTA amendment corrected both Zn and Fe deficiencies and FeEDDHA corrected Fe deficiency. Among those factors observed in trifoliate orange which might have contributed to its susceptibility for Fe and Zn deficiencies were the high P, high K, and high Ca contents in leaf tissue compared to the low content of these elements in rough lemon which has a high degree of resistance to Fe and Zn deficiencies. Author

N65-34320# Florida State Univ., Tallahassee. Dept. of Chemistry.
COPPER PROTEINS AND OXYGEN: CORRELATIONS BETWEEN STRUCTURE AND FUNCTION OF THE COPPER OXIDASES
Earl Frieden, Shigemasa Osaki, and Hiroshi Kobayashi (Harvard Univ.) 15 May 1965 45 p refs *Its* Bull. No. 21
(Grant PHS-HE-08344)
(FSU-2690-21)

A comprehensive survey of the interaction of the copper proteins and oxygen is presented, including a correlation of structure, function and other properties of the known copper oxidases and of hemocyanin. The oxygen reactions of hemocyanin, ceruloplasmin and cytochrome oxidase show half-saturation values far below the other Cu enzymes. The formation of hydrogen peroxide as a reaction product is associated with the presence of one Cu atom per oxidase molecule or catalytic system. Water is the corresponding product of the other Cu oxidases with four or more Cu atoms per molecule, except for monamine oxidase. Mechanisms for the oxidase action of the two and four electron transfer Cu oxidases and tyrosinase are proposed. These reactions account for the number, the oxidation-reduction potential and the oxidation state of Cu in the resting enzyme, the cyclical change from Cu(II) to Cu(I), the diatomic nature of O_2, the sequence of the oxidation and reduction reactions and other salient features. The catalytic reactions involved in the oxidation of ascorbic acid by plant ascorbate oxidase, ceruloplasmin and Cu(II) are compared. Finally the substrate specificity, inhibitory control and the detailed mechanism of the oxidase activity of ceruloplasmin are summarized. Author

N65-34324# California Univ., Davis. School of Veterinary Medicine.
THE EFFECTS OF X-IRRADIATION ON WORK CAPACITY AND LONGEVITY OF THE DOG Annual Progress Report No. 14
A. C. Andersen Apr. 1965 78 p
(Contract AT(04-3)-472)
(UCD-472-111)

The effects of total body X-irradiation on the reproduction in the female Beagle dog were studied. It was found that the ability of the female to procreate was not seriously affected by a single total body exposure. Fractionated exposures at weekly intervals at the rate of 50 rad per week for a total of 750 rad sterilized the female dogs partially or possibly completely. The reproductive ability of control dogs reached maximum at 3.4 years of age. The ability of dams to lactate was decreased by irradiation. Available information suggests that an endocrine dysfunction is responsible for this long-term radiation effect. Losses total 57% with 75 out of 200 deaths due to neoplasms. Neoplasms of the reproductive system ranked highest (33%) with lung cancer ranking second. The pathogenesis of these neoplasms is under investigation. The 154 dogs remaining in the experiment now average 10.7 years of age. Aging is apparent in waning general appearance and decreased physical activity. Fifty-two percent of the dogs have mammary tumors, the malignant counterpart of which is a major cause of death. Case histories, gross autopsy results, and histology data are included. E.E.B.

N65-34383# Electro-Voice, Inc., Buchanan, Mich. Engineering Dept.
[RESEARCH ON A HELMET, A HARDSHELL EARPHONE SYSTEM, AND A MICROPHONE] Status Report No. 6, Aug. 15–Sep. 15, 1964
Robert C. Ramsey [1964] 6 p
(Contract AF 33(615)-1295)
(AD-460990)

Continued research focusing on the design and fabrication of a noise attenuating helmet for use by astronauts during blastoff is reported. Subjective tests indicated that the acoustic characteristics of the helmet were peaked in the bass range. Proposed is the use of a hardshell earphone for achieving additional attenuation, providing adequate attenuation of bass frequencies, and reducing inherent problems induced by intense vibration during blastoff. Studies focusing on the development of a light weight earcup for use in the hardshell were initiated. Sandwich type hardshells of an aluminum honeycomb- and foam-material were constructed, and a preliminary model constructed for testing the attenuation. Only the hardshells formed using rigid urethane foam appeared to have sufficient rigidity to be useful. S.C.W.

N65-34417# School of Aviation Medicine, Randolph AFB, Tex.
A STUDY OF SOME FACTORS RELATED TO QUANTITATIVE DETERMINATIONS BY IMMUNOELECTROPHORESIS
Warren J. Russell Dec. 1964 13 p refs
(SAM-TR-64-92; AD-461346)

Factors involved in determining antigen concentration by relating immunoelectrophoretic precipitin arc position to the origins of antigen and antibody have been analyzed by using refined immunologic systems. A highly significant linear relationship exists when the p value (diffusivity ratio) is regressed on the log antigen concentration for both albumin and γ-globulin. Statistical analysis showed that the p value difference must exceed 0.075 for albumin-antialbumin and 0.059 for γ-globulin-anti-γ-globulin before any significant difference can be declared at the .05 level. Experimentally determined equivalence and theoretic equivalence p values were compared. The observed differences were attributed to a decrease in peak antigen concentration as the antigen is moved in the electrical field. An experimental design, based on the data in this report, is presented for predicating unknown antigen concentration by immunoelectrophoresis. Author

N65-34419# Innsbruck Univ. (Austria).
COLOR DISCRIMINATION WITHOUT CHROMATIC VISION Final Technical Report, Jul. 1, 1964–Jul. 31, 1965
A. Hajos and E. Hajos 1 Jul. 1965 39 p refs
(Contract DA-91-591-EUC-3325)
(FTR-1; AD-469260)

Adaptation of chromatic aberrations artificially produced by wearing prismatic glasses, and compensation for the normal chromatic aberrations of the eye were investigated. Experiments were conducted in which the subjects wore prism

spectacles, with one eye covered. It was shown that the adaptations of the subjects to the distortions of prism spectacles—the apparent spatial dislocation of objects, the apparent curvature of straight lines, fictitious movements, etc.—were transferred from the viewing eye to the covered eye when the eye cover was interchanged. The experiments with colorblind (protanope) subjects showed that they could use the chromatic distortions caused by prism spectacles for color separation. Investigations were also performed in regard to the problems of the intermanual transfer of adaptation under variations of the absolute depth localization. Based on these findings it was shown that within a short time, a correction to the absolute depth localization develops. This correction was disturbed by the squinting caused by the prisms. R.W.H.

N65-34428*# National Aeronautics and Space Administration, Washington, D. C.
THE STATE-OF-THE-ART OF ELECTROENCEPHALOGRAPHY AND ITS ROLE IN MANNED SPACE FLIGHT
J. F. Herrick 21 Jun. 1965 21 p refs
(NASA-TM-X-57000) CFSTI: HC $1.00/MF $0.50 CSCL 06E

A collection of opinions from scientists in the fields of neurophysiology and electroencephalography is presented on the state-of-the-art of the electroencephalogram (EEG) for determining the competency of man during orbital space flight. Since competency is defined as functional adequacy, some clue to this adequacy may be found in monitoring the nervous system, particularly the electrical activity of the brain. The Soviet open literature contains information obtained from EEG's recorded during several flights of cosmonauts by placing silver electrodes on the forehead and occiput. The objective in studying the EEG's was to search for a relationship between particular variations in the EEG measurements and the overall condition of the cosmonaut in orbital flight R.R.D.

N65-34453# Joint Publications Research Service, Washington, D. C.
CELLULAR BIOLOGY
S. Ye. Severin et al 15 Sep. 1965 26 p Transl. into ENGLISH of articles from Vestn. Akad. Nauk SSSR (Moscow), no. 7, Jul. 1965 p 42–58, 94–95
(JPRS-32016; TT-65-32510) CFSTI: $2.00

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2. STRUCTURE AND FUNCTION OF BIOLOGICAL MEMBRANES N. S. Gel'man and M. A. Lukoyanova p 22–24

N65-34461*# California Univ., Berkeley. Space Sciences Lab.
A THEORETICAL AND EXPERIMENTAL STUDY OF THE MECHANICAL BEHAVIOR OF THE CORNEA WITH APPLICATION TO THE MEASUREMENT OF INTRAOCULAR PRESSURE
Nathan Jay Schwartz 28 Jul. 1965 110 p refs *Its* Ser. No. 6, Issue No. 31
(Grant NsG-600)
(NASA-CR-67160) CFSTI: HC $4.00/MF $0.75 CSCL 06P

A theoretical and experimental study was made of the mechanical behavior of the cornea. The theoretical analysis included an analytical solution for the symmetrical constraint of a thin, shallow, spherical shell by a rigid indenter. The experimental study investigated the rheology of the cornea with particular emphasis on its compliance with the requirements of the Boltzmann superposition principle. Representative results of tests on twenty enucleated hog eyes and two human eyes have been reported. The corneas of the human and hog eyes behaved as linear viscoelastic solids; the human eyes differed from the hog eyes in having a long term creep component. Several eyes were tested at the site of procurement, six to seven minutes after the animal's death, and it was established that creep is not an artifact due to aging or enucleation. The analytical and experimental results were combined to study some instruments used to detect the level of pressure in the eye. The theoretical analysis predicted that a type of elastic instability occurs during the process of flattening a small portion of the cornea; this is discussed with reference to the Goldmann and Mackay-Marg tonometers. The role of corneal creep was considered with reference to the response of the Schiotz indentation tonometer during the time dependent process known as tonography. Author

N65-34467# Naval Air Development Center, Johnsville, Pa. Aviation Medical Acceleration Lab.
A CLINICAL TEST OF NOREPINEPHRINE DEPLETION Progress Report
K. R. Brown and O. E. Payne 22 Jun. 1965 16 p refs
(NADC-ML-6511, AD-469350)

1. Determination of changes in forearm vascular resistance, before and after painful stimuli (such as the cold pressor test) is a useful test of norepinephrine depletion. 2. Reserpine causes effective depletion of norepinephrine, in healthy individuals in relatively small doses (4.0 mg given in divided doses over a 10-day interval). 3. It appears that norepinephrine depletion may result from any of the following: (a) treatment with antihypertensive medications such as reserpine; (b) prolonged treatment with sympathomimetic drugs; (c) congestive heart failure; (d) prolonged or severe exercise; (e) cerebrovascular accident in a hypertensive patient; (f) prolonged weightlessness. 4. Several clinical problems involving norepinephrine depletion have been presented, along with consideration of the possibility of its occurrence during manned flight. Author

N65-34492# Boyce Thompson Inst. for Plant Research, Inc. Yonkers, N. Y.
GROWTH OF TISSUES OF HIGHER PLANTS IN CONTINUOUS LIQUID CULTURE AND THEIR USE IN A NUTRITIONAL EXPERIMENT Technical Report, 1 Jan. 1964–30 Apr. 1965
Walter Tulecke Wright Patterson AFB, Ohio, AMRL, Jul. 1965 47 p refs
(Contract AF 33(616)-1355)
(AMRL-TR-65-101; AD-620047)

The purpose of this work was twofold: (1) to devise a continuous culture system for higher plant cells; and (2) to produce a sufficient amount of plant tissue culture for a nutritional experiment with weanling mice. The overall purpose of this work is to provide information for the evaluation of plants as food sources in long term space missions and as possible future sources of supplementary protein. Rose tissue was the most suitable for growth in liquid culture and approximately 40 pounds (20 kg) fresh weight of sterile tissue was produced from seven cultures which were harvested periodically over a period of 222 days. The cultures were of 8 liters volume and this amount was maintained by replacing the medium which was harvested. The average yield was 112 g/l fresh weight (4.6 g/l dry weight)/day. Approximately 10 pounds (5.0 kg) of contaminated rose tissue was also produced. When incorporated into a test diet for weanling mice, the sterile rose tissue was a better food supplement than contaminated rose. A bacterial contaminant which grew well with the rose tissue and did not appreciably alter the growth rate was isolated and identified as *Achromobacter liquefaciens*. Author

N65-34500*# National Aeronautics and Space Administration, Washington, D. C.
RANGE ESTIMATION OF FAMILIAR TARGETS PRESENTED AGAINST A BLACK BACKGROUND
Gary P. Beasley and Jack E. Pennington Washington, NASA, Oct. 1965 25 p
(NASA-TN-D-2845) CFSTI: HC $1.00/MF $0.50 CSCL 05H

A series of tests has been conducted to determine the human ability to judge range with no cues except the apparent size of the object viewed. This visual situation could occur in many space operations. Subjects were asked to estimate the distance to targets of known size placed at random distances and uniformly illuminated. The targets were a plane triangle, a disk, and three proportional cylinders. The tests were conducted in a 2800-foot-long darkened building. Results show that subjects tended to overestimate the range of the smaller models and to underestimate the range of the larger models. Subjects were able to estimate accurately the range of receding targets at much greater ranges than that of approaching targets. It appears possible to apply the pilot's visual acuity (the ability to distinguish fine detail) to make estimates accurate over a greater range. The point at which the size and shape of a particular target can first be resolved could determine a specific range on which subsequent estimates could be based. This possibility was not investigated in this test series, but such a technique, based on test results, is suggested. Author

N65-34507*# National Aeronautics and Space Administration, Washington, D. C.
NORMAL DURATION OF THE ELECTRIC SYSTOLE IN MAN
Ye. B. Babskiy, V. L. Karpman, and I. N. Ivanitskaya Oct. 1965 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 156, no. 6, 1964 p 1472-1475
(NASA-TT-F-264) CFSTI: HC $1.00/MF $0.50 CSCL 06P

The relationship between the duration of the electric systole and the cardiac rhythm was studied through analyses of 307 electrocardiograms from 186 men and 121 women, both groups between the ages of 17 to 59 years. All observations were divided into 7 groups, and the mean duration of the cardiac cycle, as well as of the electric cycle was computed for each group. Individual values of the duration of the Q-T interval were compared with those calculated from equation:

$$S_e = 0.383 \sqrt[3]{C},$$

where C is the cardiac cycle. A fluctuation within the limits of ±0.04 seconds was found for the observational values. The electric systole lasted about 0.01 seconds longer in women than in men; but no increase of the Q-T interval in relation to age was established. G.G.

N65-34515# School of Aviation Medicine, Brooks AFB, Tex.
SOME OBSERVATIONS OF THE CLINICAL MANAGEMENT OF THE CHIMPANZEE
Ethard W. Van Stee Nov. 1964 49 p refs
(SAM-TDR-64-45; AD-457081)

The first section describes the etiology, pathology, pathogenesis, diagnosis, and clinical management of infectious enteritis in the chimpanzee. The second section describes in detail the theory and practice of fluid and electrolyte deficit and maintenance therapy as applied to the chimpanzee. The methods described are adapted from the general techniques of Pickering and Hardy. The third section contains eight typical case histories and conclusions. The cases are not exhaustive; rather, they represent a few of the more common problems encountered in the management of a chimpanzee colony. Author

N65-34517# Army Medical Research and Nutrition Lab., Denver, Colo.
COMPARISON OF MINERAL EXCRETION (CALCIUM AND IODINE) IN ARM AND TOTAL BODY SWEAT
C. Frank Consolazio, LeRoy Q. Matoush, Richard A. Nelson, Gerhard J. Isaac, and Ronald C. Hughes 14 Aug. 1964 16 p refs
(Rept.-282; AD-447380)

Calcium and iodine excretions calculated from arm sweat samples are in fairly close agreement with those calculated from total body sweat samples, but total body sweat excretion is considered the better indicator of mineral excretion. Calcium excretion from total body sweat ranged from 71 to 76% of that obtained from arm sweat. Both calcium and iodine excretion decreased during sleeping hours when the sweat rate is approximately one-half that found during periods of activity. M.W.R.

N65-34518# Systems Technology, Inc., Hawthorne, Calif.
HUMAN PILOT DYNAMICS IN COMPENSATORY SYSTEMS. THEORY, MODELS, AND EXPERIMENTS WITH CONTROLLED ELEMENT AND FORCING FUNCTION VARIATIONS
Duane Mc Ruer, Dunstan Graham, Ezra Krendel, and William Reisener, Jr. (Franklin Inst.) Wright-Patterson AFB, Ohio, AF Flight Dyn. Lab., Jul. 1965 213 p refs Prepared jointly with Franklin Inst.
(Contract AF 33(616)-7501)
(AFFDL-TR-65-15; AD-470337)

The description of human pilot dynamic characteristics in mathematical terms compatible with flight control engineering practice is an essential prerequisite to the analytical treatment of manual vehicular control systems. The enormously adaptive nature of the human pilot makes such a description exceedingly difficult to obtain, although a quasi-linear model with parameters which vary with the system task variables has been successfully applied to many flight situations. The primary purposes of the experimental series reported are the validation of an existing quasi-linear pilot model, and the extension of this model in accuracy and detail. Author

N65-34537# Human Factors Research, Inc., Los Angeles, Calif.
GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: CHART SCALE AND PILOT PERFORMANCE
James J. Mc Grath, William E. Osterhoff, and Gail J. Borden Jul. 1965 37 p refs
(Contract Nonr-421800)
(TR-751-4; AD-619780)

An experiment was conducted to test the hypothesis that the Sectional Aeronautical Chart could be reduced in scale without detrimental effect on geographic orientation performance. Using a cinema method to simulate the visual aspects of low-altitude navigation, pilot orientation performances were measured under different chart conditions. Under one condition the pilots used a standard 1:500 000 scale Sectional and under the other condition they used the same chart reduced to a 1:1 000 000 scale. The results did not support the hypotheses, but showed that chart scale had a significant effect on orientation performance. However, the direction of the effect depended upon the particular route flown. Orientation performance was better with the reduced scale on one route, but better with the standard scale on another route. A theoretical explanation of the complex results was offered, based on orientation strategies adopted by the pilots under different conditions of flight. The implications of the orientation-strategy model for the design of aeronautical charts and navigation displays were discussed. Author

N65-34545# Air Force Systems Command, Wright-Patterson AFB, Ohio. Behavioral Sciences Lab.
A PRELIMINARY STUDY OF THE EFFECTS OF BRIEFING LEVELS ON RECONNAISSANCE PERFORMANCE WITH SIDE-LOOKING RADAR Technical Report, Jan.–Mar. 1964
J. C. Welch and Don F. Mc Kechnie Oct. 1964 25 p ref
(AMRL-TR-64-101; AD-608887)

Sixteen Air Force navigators were tested, after appropriate training, on four strips of side-looking radar imagery. The imagery, at a scale of 1: 197000, moved across a back-lighted 14- by 14-inch screen at 3.3 inches per minute—corresponding to 500 knots. The subject's task was to identify all airfields, bridges, tank farms, power lines and railroad yards. The speed and accuracy of locating and identifying these targets under four different levels of briefing were assessed. The four briefing levels were: none, 10 minutes study of the corresponding chart prior to the simulated flight, access to the chart during but not prior to the flight, 10 minutes study of the chart prior to the flight and access to it during the flight. Fifty-six percent of the targets were correctly identified. On the average the target traveled 3.1 inches (56 seconds) after first appearing on the screen before being identified. False positive responses averaged 30%. The briefing levels compared, however, had no significant differential effects on the speed and accuracy of identifying targets or on the number of false positives. This should not be interpreted to mean that briefings will not be required for side-looking radar. It does suggest that new briefing techniques and materials will need to be developed.
Author

N65-34557# Tufts Univ., Medford, Mass.
THE MEASUREMENT OF CONFIDENCE AND TRUST Interim Report, Nov. 1964–Apr. 1965
Thornton B. Roby and Teresa Carterette (Simmons Coll.) Bedford, Mass., AFSC, Electron. Systems Div., Apr. 1965 35 p refs
(Contracts AF 19(628)-2450; Nonr-494(15))
(ESD-TDR-65-299; AD-619953)

This report is concerned with the development of a research methodology and a theoretical framework for investigating the effects of social influence in a simple judgmental situation. The laboratory task entails a simple binary judgment as to whether a displayed angle departs from 90°; before making his own response the subject is provided with the answer of a hypothetical partner, programed at a certain fixed accuracy level. The responses are made in terms of a special betting scheme which penalizes the subject for overstating or understating his confidence. The two main experimental variables in this study are the difficulty of the discrimination and the announced reliability of the hypothetical partner. Theoretical predictions as to the effects of these variables on the relative value of confidence measures are confirmed. However, further methodological development is required to increase the realism of subjects' confidence scores.
Author

N65-34570# Philco Corp., Blue Bell, Pa. Advanced Communications Lab.
VOICE SOUND RECOGNITION Final Report, Apr. 1964–Apr. 1965
Charles F. Teacher and Casimir F. Piotrowski Griffiss AFB, N. Y., RADC, Jul. 1965 124 p refs
(Contract AF 30(602)-3384)
(RADC-TR-65-184; AD-619964)

This report examines the merits of a new speech perception theory and its application to the voice sound recognition problem. Most conventional speech recognition systems require 7 important parameters to activate the recognition logic: the frequency of the first three formants, the amplitude of the first three formants and a voice-unvoiced decision. The theory tested uses just three important parameters: the frequency of a "single equivalent formant" (SEF), the SEF amplitude, and a voicing decision. This decrease of more than two to one in input parameters should mean significantly more than a two to one reduction in the complexity of the recognition logic. Statistics were compiled on a set of 20 words uttered by an ensemble of 5 speakers (3 male and 2 female). Although some recognition confusions were encountered in some phonetically similar sounds they were not unexpected, since the statistics were compiled on segmented phonemes (sans transient cues). However, other confusions were the result of imperfect parameter extractors, and hopefully will be corrected as improved circuits are developed. Recognition rates as high as 98 percent were measured in this initial phase of the program.
Author

N65-34571# Rome Air Development Center, Griffiss AFB, N. Y.
SPEED OF IDENTIFICATION OF TELEVISED SYMBOLS AS A FUNCTION OF VERTICAL RESOLUTION Final Report
Merrill F. Elias Jul. 1965 28 p refs
(RADC-TR-65-239; AD-619959)

An experiment was performed to determine the effect of vertical symbol resolution on speed of identification of televised letters and numbers. Subjects viewed 36 alphanumeric symbols, 10 times under 7 conditions of symbol resolution (5 to 11 scan lines), and under a solid-symbol (nontelevised) control condition. Performance showed a progressive improvement from 5 to 11 lines, but did not reach a level obtained with solid symbols. It was concluded that 11 lines approaches an optimal level of resolution, and that reduction in symbol resolution much below 11 lines should be approached with caution.
Author

N65-34581* Argonne National Lab., Ill.
METHODS IN THE EVALUATION OF RADIATION HAZARDS IN MANNED SPACE FLIGHT
Douglas Grahn and Wright H. Langham (Los Alamos Sci. Lab.) *In* NASA, Washington 2d Symp. on Protec. Against Radiations in Space 1965 p 59–64 refs Prepared jointly with Los Alamos Sci. Lab. Sponsored by AEC (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

Early incapacitation, progressive incapacitation, and chronic injury are considered in a discussion of radiation hazards in manned space flights. Limiting systemic and/or tissue responses which result in immediate or early incapacitation are acute gastrointestinal and hematopoietic symptomatologies, widespread erythema and blistering, and degradation of general operational skills or reduced performance capacity. The above responses, which require emergency or abort dose determination, should be examined in a probabilistic manner. Progressive incapacitation, resulting principally in hematopoietic injury, follows fractionated or protracted exposures. An equivalent residual dose concept, which has not been validated in man, may have use in cases where injury level does not affect the recovery mechanisms. A simple unweighted dose accumulation may be of value in cases with higher daily doses and fractionated exposures. Chronic or long-term effects of radiation exposure, which are considered of secondary importance in the evaluation of hazards of manned flights, require a dose accumulation measure.
M.W.R.

N65-34582* Oak Ridge National Lab., Tenn.
LETHAL, MUTAGENIC, AND CYTOGENETIC EFFECTS OF FAST CHARGED PARTICLES ON VARIOUS BIOLOGICAL MATERIALS

G. E. Stapleton *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 65–71 refs (See N65-34575 22-29) GPO: $3.25 CFSTI: MF $2.50
(NASA Order R-104)

Ground-based investigations of cellular responses to high energy protons and heavy particles were performed to determine lethal, mutagenic, and cytogenetic effects on various biological materials. Data obtained for *Escherichia coli* indicate the inactivation coefficient for aerobic cells changes significantly only for the high linear energy transfer (LET) carbon ions. Anaeroebic cells exhibit a higher relative biological effectiveness (RBE) for 22 MeV protons and heavy carbon ions than for other radiations. Protons of 100 to 750 MeV exhibit the same mutagenic effects as X-rays. The RBE's for cellular inactivation and mutation in neurospora, and of different radiation on gametogenesis in the mouse, are tabulated. Coefficients of chromosomal aberration production for proton irradiation of human leukocytes is reported along with RBE values. Data given for all four cellular systems indicate that there is a response to increasing LET with a change in RBE; and the increase occurs within the same LET range, about 100 to 200 MeV cm^2/gm. M.W.R.

N65-34583* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

BIOLOGICAL EFFECTS OF PROTONS AND NEUTRONS IN LARGE ANIMALS

S. Tom Taketa *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 73–84 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

Data obtained from midpoint tissue doses (MTD) administered to monkeys show that the effectiveness of high energy protons in large animals may be less than that of gamma rays, X-rays, or fast neutrons. There is insufficient experimental data, however, to consider a maximum permissible emergency exposure for space explorers. Results are presented for studies to determine biological effects of high energy protons as compared to Co^{60} gamma rays in whole body irradiated monkeys. Proton exposures ranged from 200 to 950 rads midpoint air dose (MAD), and gamma exposures were from 195 to 1065 rads. Dose rate was about 20 rads per minute for both proton and gamma irradiation. Depth-dose measurements indicate a dose falloff at midpoint in gamma exposures, but a dose buildup in proton exposures. Minimal lethal doses for gamma and proton irradiated monkeys were 485 and 500 rads with MAD, 325 and 650 rads for MTD, and 340 and 565 rads for average body dose. White blood corpuscle depression occurred at about the same point for gamma and proton irradiation, with figures between 190 and 290 rads. M.W.R.

N65-34584* Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.

THE RADIOBIOLOGICAL CONSEQUENCES OF DOSE DISTRIBUTIONS PRODUCED BY SOLAR-FLARE-TYPE SPECTRA

Robert K. Jones, Duane E. Adams, and Irving J. Russell (AF Weapons Lab.) *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 85–96 refs Prepared in cooperation with AF Weapons Lab. (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

None of the three high flux flares examined would have represented a serious radiation hazard to an astronaut in polar orbit, even if he would have experienced the full flux in a Gemini vehicle shielded only by the magnetosphere. Proton flux for the three events, represented a range of spectral types and each event was in excess of 30 MeV. It is concluded that there would be no danger even if the alpha particle componen were to lead to a doubling of the surface dose. In addition to the partial shielding from the Gemini vehicle, the effect of the flare is ameliorated by the relatively low surface dose, steep depth dose profile, and protracted delivery of the dose. Additional protection can result from approximately 5 gm/cm^2 of shielding properly disposed about the astronaut; this would reduce dosage to eyes, chest, and gonads by a factor of three to 10 with the addition of only 20 pounds of weight. Difference in white blood count and platelet responses of sheep to neutron and X-ray radiations is charted. A comparison of the death distribution derived from the three higher doses of fission spectrum neutrons and X-rays reveals that neutron-exposed sheep die somewhat sooner than those exposed to X-rays. M.W.R.

N65-34585* California Univ., Berkeley. Lawrence Radiation Lab.

EFFECT OF HIGH-ENERGY PROTONS AND ALPHA PARTICLES ON SMALL MAMMALS

Charles A. Sondhaus *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 97–103 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50
(NASA Order R-104)

A review of experiments on rats and mice indicates a value of relative effectiveness about 0.7 to 0.8 times that of 250 kVp X-radiation for 50% mortality at 30 days for protons at several energies above 50 MeV. Whether the exposure is monodirectional or isotropic, both the build-up of secondary particle dose and the gross nonuniformity of total dose distribution are minimal in this energy range. The difference in relative predominance of gut and bone marrow injury has been found with alpha particle exposures as well as with protons. Both calculation and experiment suggest that a gamma photon flux at ordinary X-ray energies will produce a high secondary electron flux in small cavities, and this may result in a higher dose to bone marrow than to soft tissues. It is concluded that dose distribution, and probably dose rate factors are at least as important as the ionization density or LET in assessing relative effects of high energy particles on mammalian systems. M.W.R.

N65-34586* California Univ., Berkeley. Donner Lab.

BIOLOGICAL EFFECTS OF HEAVY IONS

Paul Todd *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 105–114 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50
(NASA Order R-104)

Experiments with primary cosmic rays, neutron-induced reactions, and accelerated heavy ions are discussed in a paper dealing with the biological effects of heavy ions. The distinguishing characteristic of heavy ion radiation is its ability to kill large numbers of cells with very high probability; a single heavy ion can produce this lethal effect. Mutagenic and physiological effects seem less sensitive to large increases of the LET of ionizing radiations. A maximum mutation cross section in yeast, for example, appears at 100 $Å^2$, which is not much greater than a single nucleotide. Relative cell losses in a homogeneous biological system exposed to primary cosmic radiation are expected to be 1.1, and 0.7 for heavy, medium, and light nuclei, respectively, assuming that a heavy nucleus inactivates each cell it traverses. It is yet to be determined whether heavy nuclei inactivate all cells through which they pass or only those cells which are struck in the nucleus. M.W.R.

N65-34587* Battelle Memorial Inst., Columbus, Ohio.
A SUMMARY OF RADIATION EFFECTS THRESHOLDS
Donald J. Hamman *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 117-120 (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

Relative radiation effect thresholds of four types of materials in a neutron environment indicate that structural metals are the most radiation resistant, followed by ceramics and electronic materials, and semiconductors are the most sensitive to radiation. A table of relative radiation resistance of polymers suggests that polyurethane rubber is one of the most resistant elastomers to radiation degradation; natural rubber has about the same resistance. Of the organic materials, the filled phenolic and epoxy resins are probably the most resistant, and tetrafluoroethylene is the most sensitive. Of the electronic materials and devices, the organic insulations and magnetic materials are the most resistant; other items, in order of decreasing radiation resistance, are piezoelectric crystals; resistors, capacitors, and electron tubes; transducers; organic insulation; and semiconductors. M.W.R.

N65-34591* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
STATUS REPORT ON THE SPACE RADIATION EFFECTS ON THE APOLLO MISSION. A: APOLLO DOSE LIMITS
John Billingham *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 139-141 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

Radiation protection criteria specified for crew members in earth orbital and lunar Apollo missions are reviewed, and the various recommendations which led to the establishment of radiation dose limits are summarized. The radiation exposure dose limits are tabulated according to critical organ; maximum permissible integrated dose, rem; RBE, rem/rad; average yearly dose, rad; maximum permissible single acute emergency exposure, rad; and location of dose point. The maximum permissible single acute emergency exposure, rem, is also tabulated for each critical organ. Operational avoidance procedures are discussed, and it is estimated that the probability of no exposure to doses higher than the emergency limit is greater than 0.995; the probability of serious injury or death is lower than 1 even if the doses reach the limit. M.G.J.

N65-34592* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
STATUS REPORT ON THE SPACE RADIATION EFFECTS ON THE APOLLO MISSION. B: APOLLO SHIELDING ANALYSIS
Donald E. Robbins *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 143-145 ref (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

The calculations used, and the general results obtained from an analysis of space radiation doses inside the Apollo spacecraft are discussed. Two computer programs, used for predicting the dose from alphas and protons, are briefly described. In the spherical geometry program the spacecraft was broken into spherical solid angles with components homogenized for each solid angle, and only the primary dose was calculated, using the range energy relation for energy degradation. As the geometry description was unrealistic, the second program was written to describe the spacecraft components both chemically and geometrically, and to place them in a vehicle coordinate system. Preliminary results show that a spatial variation of a factor of two was found between points near the center of the spacecraft and the inside surface of the skin. Supporting data used in the studies are also mentioned. M.G.J.

N65-34593* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
STATUS REPORT ON THE SPACE RADIATION EFFECTS ON THE APOLLO MISSION. C: APOLLO RADIATION ENVIRONMENT ANALYSIS
Jerry L. Modisette *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 147-149 ref (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

An Apollo radiation environment analysis, based on a compilation of solar particle events over the last sunspot cycle, shows the Apollo radiation hazard to be less severe than originally estimated. The frequency of occurrence of solar proton events plotted against the sunspot number showed a correlation coefficient of 0.7. Although scatter made it impossible to determine the exact relationship between events and the sunspot number, it was concluded that a relationship exists between the sunspot number and the number of protons, and that there is a tendency for proton events to occur in groups. Procedural details are given for estimating the distribution of proton events for a hypothetical two-week mission. An approach to an operations environment analysis is also discussed, with dose distribution used rather than flux because of the variation in shielding and spectrum over different parts of the mission. Results indicate that there is less than 1 chance in 1000 that the emergency dose limits will be exceeded inside the command module on the first lunar mission. M.G.J.

N65-34594* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
STATUS REPORT ON THE SPACE RADIATION EFFECTS ON THE APOLLO MISSION. D: OPERATIONAL PROCEDURES FOR APOLLO DOSE RADIATION
Peter W. Higgins *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 151-156 (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

Various methods for achieving dose reduction from solar proton radiation are discussed. Emphasis is placed on operational procedures which imply the use of mission modifications rather than an increase of shield thickness to achieve additional radiation protection. The procedures outlined include observations to detect the approach of a solar proton event by a worldwide network of solar hydrogen-alpha and radio frequency telescopes; seven optical telescope units, and three radio telescope units are planned. The development of the Solar Particle Alert Network (SPAN) is also discussed. It is pointed out that, based upon this solar-proton-event information, dose reduction can be obtained by reducing the exposure time, with the time reduction determined in relation to the expected size and severity of the event. M.G.J.

N65-34596* Oak Ridge National Lab., Tenn.
CALCULATED TISSUE CURRENT-TO-DOSE CONVERSION FACTORS FOR NUCLEONS OF ENERGY BELOW 400 MeV
W. E. Kinney and C. D. Zerby (Union Carbide Res. Inst.) *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 161-172 refs Prepared in Cooperation with Union Carbide Res. Inst. (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50
(NASA Order R-104)

A series of Monte Carlo calculations were carried out to determine details about the energy deposition in tissue as a function of depth. From these data, rad and rem doses were calculated; and current-to-dose conversion factors for the surface and 5-cm depth doses, and for the average whole body and peak doses were extracted for hazard evaluation. Both

incident neutrons and protons from 60 to 400 MeV incident energy were considered. The methods employed in the calculations are described, and the results compared with experiment and previous data. Results indicate that heavy particle recoils make a significant contribution to the rem dose for the case of incident neutrons or protons. In the case of incident protons, the contribution is on the order of 10 to 20 percent, but for incident neutrons it constitutes the greatest fraction of the total contribution. Based on these findings, it is assumed that the rem dose at any depth from incident protons can be calculated accurately unless the secondary radiation created in the body is taken into consideration. M.G.J.

N65-34597* Oak Ridge National Lab., Tenn.
THE SECONDARY-PARTICLE CONTRIBUTION TO THE DOSE FROM MONOENERGETIC PROTON BEAMS AND THE VALIDITY OF CURRENT-TO-DOSE CONVERSION FACTORS
D. C. Irving, R. G. Alsmiller, Jr., W. E. Kinney, and H. S. Moran *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 173–176 ref (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50
(NASA Order R-104)

The validity of the current-to-dose conversion factors was investigated for the case of monoenergetic protons isotropically incident on an infinite slab shield followed by a slab of tissue. Calculations were done by the Monte Carlo method using the nucleon transport code. Carbon, aluminum, and copper were considered as shield materials, and in all calculations a 30-cm thick slab of tissue followed the shield. Monoenergetic protons of energy (100 or 400 MeV) were taken to be incident on the shield with the angular distribution of a current due to an isotropic flux. Details on the calculations are given, and typical results are tabulated. Data show that the current-to-dose conversions generally provide a fair estimate of the actual dose, and in most cases the actual dose is bracketed by the two estimates; in no case did a current-to-dose conversion disagree with the actual dose by more than a factor of 2. The relative contribution of primary and secondary particles to the total dose was determined, and the error involved in a calculation which neglected secondary particles was estimated. M.G.J.

N65-34598* Oak Ridge National Lab., Tenn.
THE VALIDITY OF THE STRAIGHTAHEAD APPROXIMATION IN SPACE VEHICLE SHIELDING STUDIES
R. F. Alsmiller, Jr., D. C. Irving, W. E. Kinney, and H. S. Moran *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 177–181 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50
(NASA Order R-104)

To test the validity of the straightahead approximation, calculations were carried out and compared with results obtained with the angular distribution of the secondary particles taken into account. The straightahead approximation is applied to both elastic and nonelastic collisions, and all emergent particles are assumed to go in the forward direction. The nucleon transport code, with which the exact calculations were done, was used; the only change made in the code was in the angular distribution of the scattered particles. From the results of the comparative data, the straightahead approximation appears to be quite good. An alternative procedure is also discussed, in which the straightahead approximation current at the shield tissue interface is calculated, and the current-to-dose conversion factors are applied to this current. Results of the case considered showed that the normal conversion underestimates the primary proton and total dose, but overestimates the secondary proton and secondary neutron dose. It was pointed out that as Monte Carlo methods were used in the calculations, a standard deviation of about 10% is associated with each entry. M.G.J.

N65-34603* Boeing Co., Seattle, Wash.
FRACTIONAL CELL LETHALITY APPROACH TO SPACE RADIATION HAZARDS
S. B. Curtis, D. L. Dye, and W. R. Sheldon *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 219–223 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

A method of radiation hazard evaluation has been introduced in which the fractional number of cells of an organ killed or inactivated is calculated. This fractional cell lethality (FCL) depends only on the particle energy spectrum and the probability of cell inactivation. Recent data on inactivation cross sections of human kidney cells have been used to calculate the contribution of protons, alpha particles, and M-group particles to the FCL of the kidney. The results indicate that the proton and alpha particle contributions would have been the same order of magnitude for the 12 November 1960 giant flare and that their relative contribution does not vary much with shielding thickness. For a seated astronaut, the FCL values are on the order of 5 percent under reasonable shielding at points 4 and 6 cm inside the body at the waist. When data on inactivation cross sections become available on more critical organs, containing cells not replaced by the body, this approach may yield a realistic evaluation of the hazard from high LET radiation on extended space missions. Author

N65-34605* Republic Aviation Corp., Farmingdale, N. Y.
QUALITY FACTORS FOR DEGRADED PROTON SPECTRA
Richard Madey and Thomas E. Stephenson *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 229–234 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

Analytical expressions were derived for the quality factors (QF) averaged over the proton dose absorbed in tissue at the center of a spherical shell shield bombarded by a spectral distribution of omnidirectionally incident protons. The relationship between linear energy transfer (LET) and QF is tabulated, and implies that the QF for X- and gamma-rays is close to unity, and for electrons is greater than unity only at very low energies. A log-log plot shows the monoenergetic QF as a function of LET. Equations are given for calculating the QF at the center of a water sphere for omnidirectionally incident proton spectra as a function of the size of the sphere, expressed in terms of the kinetic energy of a proton that comes to rest after penetrating a distance equal to the radius of the sphere. The relative contributions to the mean QF from the high and low LET portions of a degraded spectrum at the center of a water sphere, bombarded by a solar proton flux with a spectral exponent $\gamma = 2.8$, are plotted as a function of the sphere radius measured in terms of the proton threshold penetration energy. M.G.J.

N65-34607* Oak Ridge National Lab., Tenn.
AN APPLICATION OF THE GENERALIZED CONCEPT OF DOSIMETRY TO SPACE RADIATIONS
H. A. Wright, G. S. Hurst, and E. B. Wagner *In* NASA, Washington 2d Symp. on Protec. Against Radiations in Space 1965 p 245–250 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50
(NASA Order R-104)

The application of the generalized concept of dosimetry to the dosimetry of high energy protons is illustrated. Calculations have been made of the distribution of energy losses in an array of silicon detectors exposed to an isotropic flux of monoenergetic protons. The array consists of a main crystal of dimensions 1 × 1 × 1 cm bounded on each of its six faces by a crystal of dimensions 0.1 × 1 × 1 cm. A computer code has been used to plot the distribution of energy losses for several selected energies up to 400 MeV. An energy loss operator is defined which transforms an energy loss distribution function into a dose function. This operator can be used to calculate the rem dose accurately at selected energies and to within a given tolerance at intermediate energies. An electronic circuit is described which selects energy loss signals from the detector and routes them to the appropriate section of a data processor, thus permitting the calculation of the dose received from radiation by high energy protons of arbitrary energy spectrum.
Author

N65-34611* California Univ., Berkeley. Lawrence Radiation Lab.
PRIMARY AND SECONDARY-PROTON DOSE RATES IN SPHERES AND SLABS OF TISSUE
Roger Wallace, Palmer G. Steward, and Charles Sondhaus *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 301–329 refs (See N65-34575 22-29) GPO: $3.25 CFSTI: MF $2.50
(Contract W-7405-ENG-48)

A code has been developed for the depth dose relation in spheres of tissue due to primary protons and to cascade, evaporation, and hydrogen elastically scattered secondary protons. It is shown that the dose rate at a depth *d* in a slab due to a normally incident parallel broad beam of protons is the same as the dose rate at the center of a sphere of radius *d* when an isotropic flux is incident upon the sphere. The depth dose results are checked by experiments using 730 MeV protons, and compared with Monte Carlo calculations performed at Oak Ridge for 400 MeV protons. The results show that the depth dose pattern varies widely with proton energy and sphere size. For certain intermediate proton energies, the primary protons cause a peak dose rate at a predictable depth in the sphere. The secondary proton dose rate increases with increasing incident proton energy, sphere size, and depth. Protons of 730 MeV cause a secondary proton dose at the center of a 2.5-cm radius sphere which is 14% of the total dose, 35% for a 10-cm radius, and 48% for a #25-cm radius. Author

N65-34620* North American Aviation, Inc., El Segundo, Calif.
THE IMPORTANCE OF SPACE RADIATION SHIELDING WEIGHT
E. R. Beever and D. H. Rusling *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 407–414 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

The shielding weights required to protect astronauts against space radiation should be considered in relation to the weights of the meteoroid shielding and the life support systems. Comparisons have been carried out for a variety of crew sizes and mission durations. The radiation shield weights were based upon a 1% probability and were obtained from Webber's data on solar proton events. A mission dose of 100 rad was used as the allowed limit. The doses allowed from solar events were reduced by 45 mrad/day due to galactic radiation and by the amount of radiation expected for two high thrust trips through the earth's trapped radiation belts. In the calculation of the shield weights, the "storm cellar" concept was employed, allotting 50 ft^3 per man. The single shield thicknesses calculated were modified to take into account the reduced penetration where two facing sheets with space between them are used as the meteoroid shield. A 1% probability of penetration was assumed in calculations.
Author

N65-34629* United Nuclear Corp., White Plains, N. Y.
ANALYTICAL FORMULATION OF PROTON DOSE RATES BEHIND SPHERICAL MULTILAYER SHIELDS
F. R. Nakache *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 485–491 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50
(Contract NAS8-5277)

As a part of the studies on spherical minimum weight proton shields, analytical expressions were derived for calculating several types of primary proton dose rates, such as average body doses, skin doses, depth doses, and local doses. These expressions are believed to be more general and capable of wider application than those heretofore found in the literature. In addition, they eliminate the need of numerical integration. The only restrictions to their application are that the shield layers and the crew man model must be spherical, and the incident proton spectra must have an isotropic angular distribution.
Author

N65-34630* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE CALCULATION OF PROTON PENETRATION AND DOSE RATES
Martin O. Burrell *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 493–505 refs (See N65-34575 22-29) GPO: $3.25 CFSTI: MF $2.50

Calculational methods for the determination of the proton energy degradation and flux attenuation as a function of penetration depth in various materials are discussed and innovations to previous methods are presented. The main improvement proposed is the introduction of an approximation for the proton range which represents the theoretical data with an accuracy of ±4% or better for energies from around 5 MeV to 1200 MeV. The energy spectra of primary protons; multilayer shields; nonelastic proton collisions and secondaries; and proton dose rate expressions for the primary proton tissue dose or dose rate as a function of shield thickness or depth dose in tissue are considered. Analytical calculations are compared with those derived from numerical methods. Results obtained by the equations presented compare favorably with values obtained by others. Limitations of the method are also discussed.
E.E.B.

N65-34631* Naval School of Aviation Medicine, Pensacola, Fla.
LOCAL DOSE FROM PROTON AND ALPHA PARTICLE ENDERS BEHIND COMPLEX SHIELD SYSTEMS
Hermann J. Schaefer *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 507–512 refs (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50
(NASA Order R-75)

Flux ratios as high as 1 to 1 for protons/alpha particles in the integral rigidity spectra of some flare produced solar beams have been reported. Evaluation of tissue depth doses for the shield configuration of the Apollo vehicle shows that the alpha component contributes significantly to total exposure only for low shielding and only in the superficial layers of a tissue target. The fractional high LET dose due to alpha enders, however, is substantially larger than the corresponding dose from proton enders even at greater depths. Separate measurement of the high LET fraction of total dose and proper determination of RBE and QF factors, therefore, seems of even greater importance for the alpha component than for protons.
Author

N65-34632* North American Aviation, Inc., El Segundo, Calif.
RBE OF PROTONS AND ALPHA PARTICLES
J. W. Haffner *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 513-525 refs (See N65-34575 22-29) GPO: $3.25 CFSTI: MF $2.50

The RBE-LET (relative biological effectiveness-linear energy transfer) relationship of Rossi was used as a starting point for an analytical investigation into the RBE of protons and alpha particles. Charge acquisition was handled explicitly, nuclear interactions, implicitly, in this study, which yielded analytical expressions for the RBE of protons and alpha particles. The expressions simplify considerably above the critical energies where the RBE = 1. The critical energies are 10.8 MeV for protons and 249 MeV for alpha particles. Continuous energy spectra of the $E^{-\alpha}$ type were also treated. Comparisons with experimental data are presented. Author

N65-34633* North American Aviation, Inc., El Segundo, Calif.
AN EXAMINATION OF THE RELATIVE MERITS OF STOCHASTIC AND NONSTATISTICAL METHODS OF COMPUTING PRIMARY IONIZATION DOSES
B. Liley and G. C. Schaedle *In* NASA, Washington 2d Symp. on Protec. Against Radiations in Space 1965 p 527-533 (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50

This paper will discuss several questions concerning computation of primary ionization doses for solar flare proton rigidity spectra with stochastic and nonstatistical methods. The following topics will be considered: (1) geometrical representations for dose computations; (2) the effect of spacecraft area density distribution function parameters on the degree of geometrical detail or precision which is desirable for dose computations with nonstatistical methods. Illustration of the effect of geometry detail on dose computed for an actual spacecraft; (3) convergence properties for the Monte Carlo method of dose computation as a function of rigidity and the geometry distribution parameters; the necessity of accounting for nuclear collisions when computing primary ionization doses; the effect of nuclear collisions on the convergence of the primary ionization dose; (4) dose computational accuracy of the statistical primary ionization dose; and (5) relative merits of nonstatistical and statistical methods of dose computation (tradeoffs between dose computational accuracy and cost). Author

N65-34634* Lockheed-Georgia, Marietta.
A SPACE RADIATION SHIELDING CODE FOR REALISTIC VEHICLE GEOMETRIES
K. M. Simpson, C. W. Hill, and C. C. Douglass *In* NASA, Washington 2d Symp. on Protec. against Radiations in Space 1965 p 535-539 (See N65-34575 22-29) GPO: $3.25; CFSTI: MF $2.50
(Contract NAS8-11164)

This paper describes a computer code system which estimates primary proton and associated secondary dose at points within complex geometric configurations. Three computer programs constitute the system. The geometry program manipulates geometric data and computes penetration thicknesses. The geometry test program scans the input geometric data for character and format errors, checks for logical inconsistencies, and plots, off line, selected cross sections of the geometric representation in order that a visual inspection of the geometric configuration may be made. The dose program combines radiation source data and geometric data and computes the dose at specified detector points. Author

N65-34676# Joint Publications Research Service, Washington, D. C.
STATE OF THE VESTIBULAR ANALYZER IN PERSONS WORKING WITH SOURCES OF IONIZING RADIATION
A. A. Model 27 Sep. 1965 7 p refs Transl. into ENGLISH from Med. Radiol. (Moscow), v. 10, no. 5, May 1965 p 71-74
(JPRS-32151; TT-65-32644) CFSTI: $1.00

The functional state of the vestibular analyzer was investigated by means of caloric and rotation tests. It was indicated that the stimuli of the vestibular analyzer that differed in nature acted on the same receptor apparatus of that analyzer, and calorization was a weaker stimulus than rotation. Disturbances in functional state of the vestibular analyzer were observed in 44 subjects. In five subjects the experimental nystagmus lasted longer in response to the stimuli of varied intensity. In some cases the experimental nystagmus was shorter or its latent period grew longer; this was combined with a normal response to rotation. Therefore, calorization was insufficient to obtain a normal response, while rotation produced a normal response. A decline in the functional activity was observed in these cases. Cases of stronger vestibular responses to the calorization test than to the rotation test were also observed; this indicated a paradoxical response and was attributable to disturbances in the autonomic regulation of subcortical formations. R.W.H.

N65-34678# Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine.
TOLERANCES OF THE HUMAN FACE TO CRASH IMPACT
John J. Swearingen Jul. 1965 26 p refs
(AM-65-20)

Evaluation of the injury potentials of commercial airline seat structures, light-aircraft instrument panels, and other deforming structures requires data on forces that produce fractures, lacerations, or unconsciousness when applied to different parts of the face. Unconscious commercial passengers, although not seriously burned, may asphyxiate or burn to death in a few minutes. Data of facial tolerances of living human heads and forces required to render unconsciousness were gathered by an intensive study of injuries in automobile accidents. These data were checked by making a series of 45 cadaver head impacts against deforming structures. Results show that blows of as low as 30 to 40 g for 10 to 40 milliseconds will produce temporary unconsciousness. Maximum forces that may be tolerated without fracture when the face is impacted against a surface that is designed to deform and conform to the contour of the facial bones are given. Author

N65-34680# Picatinny Arsenal, Dover, N. J.
THE HEALTH HAZARDS OF CERTAIN SMOKE DYES IN CURRENT USE
Alfred F. Tatyrek Sep. 1965 26 p refs
(PA-TM-1674; AD-469867)

A literature survey and discussions with qualified toxicologists has disclosed that: (1) Yellow dye, Indanthrene Golden Yellow, MIL-D-50029B, is toxic and may contain traces of 2, 4, 8, 9-dibenzpyrene, a very hazardous carcinogen (cancer-producing material). (2) Red dye, 1-methylaminoanthraquinone, MIL-D-3284A, is a skin sensitizer and is possibly a carcinogen. (3) Yellow dye, auramine hydrochloride, is hazardous because it is very toxic and is a potent carcinogen. (4) Small, repeated doses of a carcinogen are the most hazardous type of exposure an individual may be subjected to. The toxic and carcinogenic health hazards associated with the currently used smoke dyes, and also with possible candidates for smoke dyes, are discussed with reference to effects of exposure, chemical structure, hazardous impurities, and pyrolysis reaction products. Recommendations for avoiding these health hazards are also presented. Author

N65-34683# Naval Ordnance Test Station, China Lake, Calif.
VISUAL SEARCH EXPERIMENTS: ACUITY, RESPONSE TIME, NOISE PERSISTENCE
Ronald A. Erickson Jul. 1965 51 p refs
(NAVWEPS-8731; NOTS-TP-3787; AD-619507)

This experiment demonstrated the degradation in search performance resulting from a decrease in the frame rate of a static, structured display containing television-type visual "noise". The display was produced by projecting moving pictures of the static, structured scene; the noise in the scene was obtained by the double exposure and special printing of the film. Results indicate that restricted usefulness of a low frame rate, television-type display may be expected in a low signal-to-noise ratio condition. Neither peripheral and foveal acuity nor eye dominance scores correlated significantly with search time. There was a significant correlation between response time and search time; this is attributed to the mental image processing and decision time common to both tasks. Author

N65-34684# George Washington Univ., Washington, D. C. Human Resources Research Office.
THE EFFECT OF TRAINING ON ACCURACY OF ANGLE ESTIMATION
T. Gary Waller and Robert H. Wright Aug. 1965 32 p refs
(Contract DA-44-188-ARO-2)
(TR-65-8; AD-619958)

This study examined the feasibility of using direct perceptual estimation on maps to determine angles of drift, and the effect of training on this ability. Subjects were divided into a control group and two training groups, one of which was trained using angles drawn on plain white cards, and the other using angles drawn on both cards and tactical maps. Both training groups initially estimated the size of angles, ranging from 1° to 18°, with a mean absolute error of 2.57° and a mean algebraic error of −0.20°. After training, absolute error was 1.34° and algebraic error was +0.43°. A job aid consisting of reference angles of 5°, 10°, and 15° did not significantly affect performance on map items, although on card items, performance of the training groups shifted from underestimation to slight overestimation of angle size. Author

N65-34703# Battelle-Northwest, Richland, Wash.
SWIN IN BIOMEDICAL RESEARCH Selected List of References, 1960–May 1965
J. C. Pekas and L. K. Bustad Jun. 1965 157 p refs
(Contract AT(45-1)-1830)
(BNWL-115)

IAA ENTRIES

A65-32416
BEHAVIOR OF PLANTS UNDER EXTRATERRESTRIAL CONDITIONS - SEED GERMINATION IN ATMOSPHERES CONTAINING NITROGEN OXIDES.
S. M. Siegel, Constance Giumarro, and Richard Latterell (Union Carbide Research Institute, Tarrytown, N.Y.).
National Academy of Sciences, Proceedings, vol. 52, July 1964, p. 11-13.
Contract No. NASw-767.

Experimental demonstration that seeds of common plant species can be germinated in rarefied nitrogen atmospheres containing high proportions of individual nitrogen oxides (N_2O, NO, NO_2) or their mixtures. A buffering substratum of $CaCO_3$ is especially beneficial and the best responses thereto were given by rice and sorghum in the presence of certain nitrogen oxides as compared with nitrogen alone. Cell division in the sorghum shoot in N_2/NO was demonstrated. Nitrogen dioxide was inhibitory under anaerobic conditions, but much less so when O_2 was present. It is concluded that if ordinary terrestrial flora unselected for tolerance to the oxides of nitrogen are taken as a model, their prospects for growth in a nitrogen oxide-rich atmosphere would be good provided the substratum prevents excess acidity and that NO_2 is not present in excessive quantities.
F.R.L.

A65-32567 #
THE EFFECT OF DIFFERENT NITROGEN SOURCES ON THE GROWTH AND DEVELOPMENT OF A SYNCHRONOUS CULTURE OF CHLORELLA PYRENOIDOSA PRINGSH. 82.
N. Tomova, E. Linkova, and K. Spektorov (Bulgarian Academy of Sciences, Institute of Plant Physiology, Sofia, Bulgaria).
Bolgarskaia Akademiia Nauk, Doklady, vol. 17, no. 8, 1964, p. 757-760. 12 refs.

Experimental study of the growth of a synchronous culture of Chlorella pyrenoidosa Pringsh. 82 on media with various forms of nitrogen (KNO_3, KNO_2, and $(NH_4)_2SO_4$). The procedure is described in detail and curves are plotted for the growth rate of Chlorella and the accumulation of dry mass at various pH and concentrations of these nutrients under optimum conditions of illumination (14,000 to 18,000 lux) and temperature (38 to 40°C). The changes in the cell size of Chlorella during cycles of its development are given in a diagram. Media with $(NH_4)_2SO_4$ at pH 6.5 had an optimum effect on the culture growth, and maximum numbers of autospores per mother cell were obtained in buffer media with KNO_3 as the nitrogen source. The effect of these factors on dry mass is found to be generally insignificant, with a minimum of dry mass obtained in media with KNO_2.
V.Z.

A65-32614
HYBRIDIZATION OF LACTIC DEHYDROGENASE IN VIVO AND IN VITRO.
Stanley N. Salthe, Oscar P. Chilson, and Nathan O. Kaplan (Brandeis University, Graduate Dept. of Biochemistry, Waltham, Mass.).
Nature, vol. 207, Aug. 14, 1965, p. 723-726. 20 refs.
Research supported by the National Institutes of Health and the American Cancer Society; Grant No. NsG-375.

Description of experimental results obtained on the hybridization of lactic dehydrogenase (LDH) in vitro and in live organisms. The development of methods that permit the formation of both interspecific and intraspecific hybrids makes it possible to investigate the degree of structural similarity among various LDH compounds. Most of the experiments on hybridization in vitro were carried out with highly purified crystalline enzymes which were dialyzed overnight against a 1.0 M NaCl + 0.1 M Na_3PO_4 (pH = 7.0) solution, mixed, frozen in a dry-ice/methanol bath, allowed to thaw to room temperature, and subsequently dialyzed for 3 to 12 hr against a 0.1 M Na_3PO_4 (pH = 7.0) solution to reduce the salt concentration and subjected to starch-gel electrophoresis. The hybridization behavior and binomial patterns of various animal sources of LDH are presented in tabular form. Analogous experiments with embryos of Rana pipiens, Rana palustris, and Rana sylvatica indicate that the ova as deposited contain primarily H-type LDH as determined by starch-gel electrophoresis. LDHs are classified according to their hybridization behavior.
D.P.F.

A65-32628
THEORETICAL MAN-MACHINE INTERACTION WHICH MIGHT LEAD TO LOSS OF AIRCRAFT CONTROL.
J. F. Martin (Unica Research Co., Ltd., Montreal, Canada) and G. Melvill Jones (McGill University, Aeromedical Research Unit, Montreal, Canada).
Aerospace Medicine, vol. 36, Aug. 1965, p. 713-716. 6 refs.

Development of a theoretical model of a pilot-aircraft interaction wherein the pilot relies entirely on his sense of the relative gravity vector for orientation information. It is shown that the illusory effects arising from motions could cause him to operate the aircraft controls in a manner diametrically opposite to that which would be appropriate. It is considered that this model may serve as a basis to account for otherwise unexplained losses of control in jet transport aircraft. A series of recommendations for further investigation is proposed.
F.R.L.

A65-32629 #
ENDOCRINE AND METABOLIC CHANGES DURING A 12-HOUR SIMULATED FLIGHT.
Henry B. Hale, James P. Ellis, Jr., and Edgar W. Williams (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).
Aerospace Medicine, vol. 36, Aug. 1965, p. 717-719. 17 refs.
USAF-sponsored research.

Study of 48 young men by means of serial urinary determinations while working in flight simulators for 12 hr. The simulated flights began at 0700 hr and ended at 1900 hr. Postflight values obtained at 2100 hr were compared with control values obtained at 2100 hr on the day before the test. Creatinine excretion did not show statistically significant variation with time. All other urinary constituents were expressed as ratios with creatinine. Simulated flight induced statistically significant elevations in urine volume, urea, uric acid, phosphorus, sodium, the Na/K ratio, 17-hydroxycorticosteroids, epinephrine, and norephinephrine. The NE/E ratio fell significantly.
(Author) F.R.L.

A65-32630 #
EXPERIMENTAL ANIMAL DECOMPRESSIONS TO A NEAR VACUUM ENVIRONMENT.
Richard W. Bancroft and James E. Dunn, II (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).
(Aerospace Medical Association, Meeting, Miami Beach, Fla., May 12, 1964, Paper.)
Aerospace Medicine, vol. 36, Aug. 1965, p. 720-725. 10 refs.
USAF-sponsored research; NASA Contract No. DPR T-16758-G.

Results of rapid decompression of 126 conscious dogs in either 1 or 0.2 sec from 35,000 ft, while breathing oxygen, to a pressure of less than 2 torr, in order to estimate the times of consciousness, collapse, and survival of animals exposed to near-vacuum environments. Groups of six dogs each were exposed to this low pressure for periods of time ranging from 5 to 180 sec, with and without prior denitrogenation, and then recompressed to 35,000 ft with oxygen at 5 or 30 sec. The dogs collapsed within 9 to 10 sec after decompression, as determined from motion picture films. Simultaneously, the effects of anoxia, water vapor, and other evolved gases were apparent, resulting in a generalized muscle spasticity, a few gasps, momentary convulsive seizures, apnea, and gross swelling of the body and extremities. All dogs exposed for less than 120 sec survived, despite evidence of lung involvement. Respiration recommenced spontaneously either during recompression or at ground level, providing the heart was beating; otherwise death was inevitable. The

longer the exposure time the more prolonged was the time for recovery which usually ranged from a few minutes to a few hours, except for one dog which exhibited a severe postdecompression paralysis with gradual recovery over a period of several weeks. Exposures of 120 to 180 sec resulted in approximately 15% to more than 80% fatalities, respectively. Denitrogenated dogs tended to show a slightly better survival rate. It was found that the shorter the exposure time and the faster the recompression rate with oxygen, the better were the chances for prompt recovery.

(Author) F.R.L.

A65-32631 #

EXPERIMENTAL ANIMAL DECOMPRESSIONS TO LESS THAN 2 MM. HG ABSOLUTE - PATHOLOGIC EFFECTS.

James E. Dunn, II, Richard W. Bancroft, Webb Haymaker, and John W. Foft (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).

(Aerospace Medical Association, Meeting, Miami Beach, Fla., May 12, 1964, Paper.)

Aerospace Medicine, vol. 36, Aug. 1965, p. 725-732. 14 refs.

USAF-sponsored research; NASA Contract No. DPR T-16758-G.

Results of pathologic examination of tissues of dogs rapidly decompressed to less than 2 torr. Of the 126 dogs decompressed, 92 were autopsied at three time intervals - within 30 min, 2 to 5 days, and 1 to 3 weeks after decompression. Gross examination of the tissues was done on all autopsied animals. Lung damage was graded 1+ to 4+ according to the amount of edema, emphysema, atelactasis, and hemorrhage present. Microscopic examination of the tissues was performed on selected dogs from the various groups. The most impressive finding was the absence of major pathologic damage, except in the lungs, unless the exposure time exceeded 120 sec. By varying the time of decompression and time of exposure to less than 2 torr, it was possible to separate the pathologic effects of anoxia vs time of decompression. In all dogs the severity of lung damage increased with duration of the anoxic exposure. In groups with comparable exposure times, the dogs decompressed in 1 sec exhibited pulmonary congestion, edema, and hemorrhage, while those decompressed in 0.2 sec showed predominately more petechial hemorrhages and emphysematous changes. Denitrogenation appeared to reduce the incidence and severity of lung damage. Those animals autopsied at the later postdecompression period showed evidence of resolution of all lesions, especially in the lungs. For the exposures that were longer than 120 sec, gross examination of other organs showed increasing amounts of congestion and hemorrhage. The brains showed engorgement without evidence of hemorrhage. One dog that was paralyzed from the exposure had numerous demyelinated lesions of the spinal cord that seemed to be the result of gas bubble emboli. F.R.L.

A65-32632

EFFECTS OF EXPOSURE TO A ROTATING ENVIRONMENT (10 RPM) ON FOUR AVIATORS FOR A PERIOD OF TWELVE DAYS.

Ashton Graybiel, Robert S. Kennedy, Edward C. Knoblock, Fredrick E. Guedry, Jr., Walter Mertz, Michael E. McLeod, James K. Colehour, Earl F. Miller, II, and Alfred R. Fregly (U.S. Naval School of Aviation Medicine, Pensacola, Fla.).

Aerospace Medicine, vol. 36, Aug. 1965, p. 733-754. 30 refs.

NASA-sponsored research.

Results of exposure of four carefully selected military personnel undergoing flight training to constant rotation at a speed of 10 rpm for 12 days in the Pensacola slow-rotation room. Environmental and working conditions simulated in many respects those which might obtain in a rotating orbiting spacecraft. The findings are discussed under the headings of clinical symptoms, clinical laboratory findings, and psychophysiological performance. The experiment is considered to have demonstrated that countermeasures in addition to adaptation are needed if there is immediate exposure to rotational velocities of 10 rpm and that the rotating room is a useful device for further exploration of vestibular and central nervous system mechanisms.

(Author) F.R.L.

A65-32633

HYPOKINESIA SECONDARY TO CHAIR REST FROM 4 TO 10 DAYS.

Lawrence E. Lamb, Paul M. Stevens, and Robert L. Johnson (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Internal Medicine Branch, Brooks AFB, Tex.).

Aerospace Medicine, vol. 36, Aug. 1965, p. 755-763.

Study of the effects of inactivity during chair rest for periods of 4, 6, 8, and 10 days. Despite the presence of body weight and the dependent position of the lower extremities, deconditioning occurred. The average decrease in total blood volume after 10 days was slightly greater than the average noted after 11 days of bed rest. The average plasma volume loss and the average decrease in red cell mass was similar to that observed after 11 days of bed rest. Orthostatic tolerance and exercise tolerance were progressively diminished with longer periods of chair rest. The study is considered to demonstrate that confinement resulting in muscular inactivity causes deconditioning even when normal gravitational factors cause body weight and increased hydrostatic pressure below the diaphragm. For this reason deconditioning during manned space flight may be markedly influenced by confinement with restricted body movement, independently of what influence weightlessness may have on its development. F.R.L.

A65-32634

ACUTE EFFECTS OF EXPOSURE TO HYDRAZINE AND HYDRAZINE DERIVATIVES ON RENAL FUNCTION IN THE DOG.

Ethard W. Van Stee (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).

Aerospace Medicine, vol. 36, Aug. 1965, p. 764-767. 5 refs.

Result of exposure of dogs to approximately equimolar concentrations of hydrazine, methylhydrazine, and 1, 1-dimethylhydrazine. The dogs exposed to hydrazine developed significantly decreased PAH and inulin clearance rates and renal plasma flow rates during the first four hours postexposure. The decreased glomerular filtration rate was attributed to the decreased renal plasma flow. The decreased PAH clearance was attributed to the decreased GFR and interference with active transport by the proximal renal tubular epithelium. The dogs exposed to methylhydrazine developed decreased PAH and inulin clearance rates. The mechanism producing impairment of renal function following exposure to methylhydrazine was postulated to be similar to the hydrazine-treated group. Exposure to 1,1-dimethylhydrazine caused no significant impairment of renal function measurable by these techniques. (Author) F.R.L.

A65-32635

PROBLEMS ASSOCIATED WITH MEASUREMENT OF ACOUSTIC TRANSIENTS.

George J. Harbold, Richard P. Tegt, and John W. Standeven (U.S. Naval Missile Center, Life Sciences Dept., Bio-Acoustics Div., Point Mugu, Calif.).

Aerospace Medicine, vol. 36, Aug. 1965, p. 767-773.

Documentation of the problems found as a result of efforts to improve conventional laboratory equipment and techniques for measurement of "impulse noises," - i.e., gunfire, blast, shock wave, overpressure, etc. Evaluation of laboratory microphones, tape recorders, noise-level recorders, impact-noise analyzers, and similar equipment indicated that these systems have serious limitations in response to acoustic transients. Peak intensities of impulse noise from small arms fire was found to be much greater than that previously reported (24 db or 16 times the peak pressure); moreover, measured values were not in accord with theoretical values. In view of these limitations a study was initiated to investigate the possibility of a system for impulsive noise measurement with extended transient response for field studies of a variety of weapons. Various types of microphone systems with wider frequency response and greater dynamic range were evaluated. Graphs are presented to illustrate how an extended transient response can overcome limitations of earlier systems. F.R.L.

A65-32636

EFFECTS OF SECOBARBITAL AND D-AMPHETAMINE ON PERFORMANCE DURING A SIMULATED AIR MISSION.

Richard E. McKenzie and Lois L. Elliott (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).
Aerospace Medicine, vol. 36, Aug. 1965, p. 774-779. 7 refs.

Simulation of a premission crew conditioning program and a 12-hr flight to determine the performance effects of secobarbital taken the night before and of d-amphetamine taken during the mission. The results on 48 subjects indicated that performance decrement, unpredictable by selected psychologic test scores and not related to gross physiologic measures, occurred as a residual effect of secobarbital using the SAM Multidimensional Pursuit Test as the measure of proficiency. Individuals receiving a hypnotic dose (200 mg) of secobarbital at bedtime demonstrated a performance decrement 10 hr later at the start of their simulated flight and continued to demonstrate degraded performance at the completion of their mission 12 hr later. Those subjects who received 5 mg of d-amphetamine "in flight" showed the often-documented enhancement of performance, but those who received secobarbital at bedtime and d-amphetamine in flight showed an altered response curve in terms of increased latency and lower peak performance. F.R.L.

A65-32660
BINAURAL INTERACTION IN THE ACCESSORY SUPERIOR-OLIVARY NUCLEUS OF THE CAT.
J. L. Hall, II (Massachusetts Institute of Technology, Research Laboratory of Electronics, Cambridge, Mass.).
Acoustical Society of America, Journal, vol. 37, May 1965, p. 814-823. 27 refs.
Research supported by the National Institutes of Health; U.S. Department of Health, Education, and Welfare; NASA; Army; USAF; NSF; and Navy.

Acoustic clicks presented through earphones to the two ears of anesthetized cats, and study of the electrical response activity of single nerve cells in the accessory nucleus of the superior olive. Stimulus parameters investigated included interaural time difference, interaural intensity difference, and average intensity. Attention was concentrated on cells that were excited by stimulation of the contralateral ear and inhibited by stimulation of the ipsilateral ear. The experimental results are incorporated into van Bergeijk's model for binaural interaction, for which it is postulated that localization judgments are obtained on the basis of a comparison of the amounts of response activity in the two accessory nuclei. The model yields predictions that are in agreement with results from human psychophysics. The model predicts that the virtual image should be lateralized toward the side receiving prior or more intense stimulation. A time-intensity trading relationship that is in agreement with results from "centering" experiments is derived. The model predicts minimum detectable changes in interaural time difference of 5 to 10 μsec and minimum detectable changes in interaural intensity difference of 0.1 to 0.5 db. (Author) M.F.

A65-32792 #
PHYSIOLOGICAL ASPECTS OF WALKING WITH PARTIAL LIGHTENING OF BODY WEIGHT AND VARYING FRICTION WITH THE GROUND [ASPETTI FISIOLOGICI DELLA DEAMBULAZIONE CON PARZIALE ALLEGGERIMENTO DEL PESO CORPOREO E VARIO ATTRITO CON IL SUOLO].
A. Scano and G. Meineri (Ispettorato di Sanità Aeronautica, Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome, Italy).
(Giornate Mediche delle Forze Armate, Torino, Italy, June 11, 12, 1965, Paper.)
Rivista di Medicina Aeronautica e Spaziale, vol. 28, Apr.-June 1965, p. 127-133. In Italian.

Experimental investigation of the possibility of human locomotion on the moon surface, simulating its gravity and soil consistency. The subgravity technique was used whereby body weight was relieved by an elastic suspension up to about 1/6 of normal body weight and having the subject walk on a layer of talcum powder of appropriate thickness. A typical gait was noticed, consisting of successive bounds, sometimes waddling, because of the feet sliding on the powdered surface with scant friction, not permitting a high speed (maximum, about 7 km/hr). Energy consumption increased 65%, compared to the values found in walking at 1 g (at the same speed) with no remarkable changes, but with different values of friction with the ground. Substantially similar results were obtained reducing apparent body weight to about 1/20 of its normal value. (Author) M.M.

A65-32793 #
INFLUENCE OF 5 PHENYL-2 IMINO-4 OXY-OXAZOLIDINE ON THE READINESS AND STEADINESS OF MOTOR RESPONSE IN MAN - RELATED TO FATIGUE FROM AVIATION WORK [INFLUENZA DELLA 5 - FENIL - 2 IMINO - 4 OSSO - OSSAZOLIDINA (F.I.O.) SULLA PRONTEZZA E COSTANZA DELLA REAZIONE MOTORIA NELL'UOMO - IN RAPPORTO ALL'AFFATICAMENTO DA LAVORO AERONAUTICO].
E. Bandini (Organizzazioni Militare Territoriale, Comando I Regione Aerea, Direzione di Sanità, Gruppo Sanitario dell Aeroporto di Rimini, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 28, Apr.-June 1965, p. 134-161. 19 refs. In Italian.

Experimental investigation of the effects of 5 phenyl-2-imino-4-oxy-oxazolidine on psychomotor response in 60 subjects divided into three groups (jet pilots, jet maintenance personnel, and clerks). It is noted that the results, considering the average values of the entire group investigated, seem to indicate a moderate effectiveness of the drug in improving the rapidity and regularity of motor response to visual and acoustic stimulation; however, this positive evaluation is greatly affected by the high variability of the effects produced by the drug in the individuals (ranging from a highly positive to a paradoxically negative effect), as well as by the remarkable inconstancy of the time of occurrence of the maximum effect. The practical application of the drug in aviation is not considered advisable. (Author) M.M.

A65-32794 #
pO_2 DETERMINATION IN LIVING TISSUES [LA DETERMINAZIONE DELLA pO_2 "IN VIVO"].
L. Bellelli (Istituto Regina Elena per lo Studio e la Cura dei Tumori, Rome, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 28, Apr.-June 1965, p. 162-186. 19 refs. In Italian.

Experimental determination of pO_2 in the cerebral cortex of rats. The oxygen electrode theory is briefly described, together with the characteristics of construction and fundamental properties of the most common electrodes. Technical refinements which can improve electrode response are discussed, and results of pO_2 measurements in the cerebral cortex of rats are presented, as a function of oxygen respiration. The most frequent criticisms and objections of this new method of investigation are discussed. (Author) M.M.

A65-32795 #
COLLECTION OF AIRBORNE BACTERIA BY MEANS OF SIMPLE DYNAMIC SAMPLERS [IL PRELIEVO DI BATTERI AEROGENI CON SEMPLICI APPARECCHIATURE DI CAMPIONAMENTO DINAMICO].
L. Mammarella (Ministero della Difesa Aeronautica, Centro Tecnico Chimico-Fisico Biologico, Rome, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 28, Apr.-June 1965, p. 187-198. 7 refs. In Italian.

Discussion of the results of comparative samplings of airborne bacteria by means of simple dynamic samplers. It is claimed that the perforated-disk sampler shows a slightly greater efficiency than the slit sampler; the latter has maximum efficiency in collecting droplet nuclei of mass of about 3 μ, while its ability decreases in collecting particles of progressively larger mass. The perforated-disk sampler, less selective than the slit sampler and with less efficiency, although appreciable in the 3-μ range, is better suited for sampling a good percentage of particles of larger diameter. The spherical segment vault sampler, with less efficiency, seems to be better suited to collect air-dispersed components of larger mass (of little interest for inhalation, but significant from the standpoint of the control of contact infections). (Author) M.M.

A65-32826
SURVIVAL OF ANIMALS IN MAGNETIC FIELDS OF 140,000 OE.
Dietrich E. Beischer (U.S. Naval School of Aviation Medicine, Pensacola, Fla.).
IN: BIOLOGICAL EFFECTS OF MAGNETIC FIELDS.
Edited by M. F. Barnothy (Illinois, University, College of Pharmacy, Urbana, Ill.).
New York, Plenum Press, 1964, p. 201-208. 5 refs.
NASA-sponsored research.

Account of the first exploring expansion of biomagnetic research into the range of very high magnetic field strength. The mice used in this study were young animals NIH strain with weights under 20 gm to fit into the narrow tubing in the magnet core. The animals (which included also fruit flies, sea urchin eggs, and photobacteria) were enclosed in a plastic tube which fit the core of the magnet. An alternating current similar in frequency and strength to the alternating component of the rotating generator was applied to the coil. It appears that the magnetic ripple field can be neglected in a discussion of the effects of the direct field. The final procedure of exposure of animals to very strong magnetic fields was determined by the desire to use the available volume in the core as efficiently as possible. The results of a genetic study can be summarized by stating that no temporary infertility of the Wild-type male or sex-linked chromosomal changes occurred with high frequencies in fruit flies exposed for short time intervals to high-intensity magnetic fields. It was also observed that the life cycle of animals born from exposed females was not disturbed and that hatching times and the sex ratio were not affected in such animals. The results of the exposure of animals to strong magnetic fields with a high gradient do not differ noticeably from the results obtained with strong homogeneous fields. The fact that a mammal survived prolonged exposure to a magnetic field of 120 koe increases to a certain degree confidence in the safety range in human exposure. M. F.

A65-32834
CONTRAST SENSITIVITY OF THE HUMAN EYE FOR SQUARE-WAVE GRATINGS.
H. A. W. Schober and R. Hilz (München, Universität, Institut für medizinische Optik, Munich, West Germany).
Optical Society of America, Journal, vol. 55, Sept. 1965, p. 1086-1091. 14 refs.

Measurement of the contrast threshold for perception of square-wave gratings as depending on spatial frequency for varying viewing distances, adaptation, and exposure time. The luminance varied between 1.4 and 110 cd/m^2; target distances were 1, 3.1, and 7 m. Exposure times ranged from 1.5 msec to 1 sec and unlimited. A distinct minimum threshold contrast is observed for a definite spatial frequency, which depends on the viewing distance and luminance. A decrease in exposure time causes a less significant minimum. Exposure times from 40 to 1.5 msec do not alter the curve decisively. With exposure times less than 2 msec and spatial frequencies somewhat above 0.02 lines/min of arc the optical transfer function of the eye can be measured by determination of thresholds. (Author) F. R. L.

A65-32883
ELECTROMAGNETIC EFFECTS IN THE CONES OF THE HUMAN RETINA.
G. Biernson and A. W. Snyder (Sylvania Electric Products, Inc., Sylvania Electronic Systems, Div., Applied Research Laboratory, Waltham, Mass.).
Electronics Letters, vol. 1, June 1965, p. 89, 90. 7 refs.

Demonstration by electromagnetic analysis of cones in the human retina that there are three dominant modes of light propagation in the visible range. These modes could produce three spectral-response peaks like those attributed to different photopigments and assumed to be the means of color discrimination. (Author) M. F.

A65-32922 #
PHYSIOLOGICAL OPTICS IN ASTRONOMY [PHYSIOLOGISCHE OPTIK IN DER ASTRONOMIE].
Max Rötsch.
Astronomie und Raumfahrt, no. 1, 1965, p. 11-14. In German.

Discussion of the mechanisms of human sight and associated phenomena with application to astronomical observations. The historical attempts to define the eye's sensitivity and depth of perspective are reviewed. The investigations of Fender indicate that the correct model for the human eye is not a lens system with a sensitive screen, based on experiments with subjects who wore distortion-producing prismatic glasses. These experiments indicate that the visual mechanism corrects all gross apparent aberrations, and that retinal images are not necessarily exact replicas of the objects being observed. The mechanism of rods and cones is described as explaining color differentiation and the perception of the relative intensity of illumination. It is shown that the eye is subject to chromatic aberration and that these various optical defects affect the accuracy of astronomical observations. D. P. F.

A65-32937
FACTORS AFFECTING THE RATE OF KILLING OF ESCHERICHIA COLI BY REPEATED FREEZING AND THAWING.
Elliot L. Packer, John L. Ingraham, and Stanley Scher (California, University, Dept. of Bacteriology, Davis; California, University, Space Sciences Laboratory, Berkeley, Calif.).
Journal of Bacteriology, vol. 89, Mar. 1965, p. 718-724. 21 refs.
Public Health Service Grant No. AI-05526; No. NsG-126-61.

Repeated freezing and thawing of cultures of Escherichia coli grown in a minimal medium and frozen in the same medium without carbon source resulted in a linear decrease in the logarithm of the number of surviving cells as a function of the number of freeze-thaw cycles. The slope of this curve, which can be determined accurately is an index of susceptibility of a culture to death by freezing and thawing. The effect of the physiological state of the culture on the killing rate was determined. Contrary to previous reports, the phase of growth, the state of aerobiosis, and the density of the culture had no effect on the degree of susceptibility to death by freezing and thawing. However, presence of spent growth medium (a filtrate of a stationary culture) in the freezing medium protected cells against death by freezing and thawing. Protection by spent growth medium is effective at high dilutions (1:10^5), and is lost if spent growth medium is heated in the presence of alkali. It is suggested that the protection afforded by spent growth medium accounts for differences between the results obtained and those reported in the literature. (Author) M. M.

A65-32938
SPIKE DISCHARGE PATTERNS OF SPONTANEOUS AND CONTINUOUSLY STIMULATED ACTIVITY IN THE COCHLEAR NUCLEUS OF ANESTHETIZED CATS.
R. R. Pfeiffer and N. Y-S. Kiang (Massachusetts Institute of Technology, Research Laboratory of Electronics, Center for Communications Sciences, Cambridge; Massachusetts Eye and Ear Infirmary, Auditory Physiology, Eaton-Peabody Laboratory, Boston, Mass.).
Biophysical Journal, vol. 5, no. 3, 1965, p. 301-316. 29 refs.
National Institutes of Health Grants No. MH-04737-04; No. B-1344; NSF Grant No. GP-2495; Grant No. NsG-496; Contract No. DA-36-039-AMC-03200(E).

Computation of interspike interval histograms of spontaneous and stimulated activity from spike discharges of single units in the cochlear nucleus of cats. These histograms indicate that a number of different types of spontaneous discharge patterns exist in the nucleus. The type of spontaneous activity of a given unit is related to its activity in response to continuous tones. Correlations were found between the discharge patterns of units and their anatomical locations within the nucleus. (Author) M. M.

A65-32939
THE DEPENDENCE OF CELL DIVISION IN CHLORELLA ON TEMPERATURE AND LIGHT INTENSITY.
Constantine Sorokin and Robert W. Krauss (Maryland, University, Dept. of Botany, College Park, Md.).
American Journal of Botany, vol. 52, Apr. 1965, p. 331-339. 23 refs.
Grant No. NsG-70.

Experimental investigation of the effects of temperature and light on cell division in synchronized suspensions of the high-temperature strain Chlorella 7-11-05. It was found that the time for incipient cell division, the progress in the process after it started, and the number of cells produced are influenced by temperature and light intensity. Within limits, cell division is generally favored by the increase in temperature. The increase in light intensity first favors cell division, then, after optimal light intensity is attained, a further increase in light intensity inhibits cell division. Observations are discussed in connection with the findings of other investigators. The limitations of cell division by temperature and light intensity are considered to be separate from the effects of these factors on growth. (Author) M. M.

A65-32984
THE EFFECTS OF VIBRATION ON ACCURACY OF A POSITIONING TASK.
Maurice A. Larue, Jr. (Martin Marietta Corp., Martin Co., Orlando, Fla.).
Journal of Environmental Sciences, vol. 8, Aug. 1965, p. 33-35. 5 refs.

Experimental program to determine what degradation in accuracy would occur if man were required to perform a positioning task in a vibration environment. Of particular concern were the frequency levels in the 5-to 22.5-cps range. It was concluded that, for the positioning task utilized, man in a vibration environment can achieve accuracy levels equal to those which he can achieve in a static environment as long as the frequencies are kept above approximately 5 cps. (Author) M. F.

A65-33023
THE LOCALIZATION OF A NON-TRANQUILIZER PHENOTHIAZINE IN THE DOG CEREBELLUM AND ASSOCIATED AREAS.
P. S. Guth and J. Amaro (Tulane University, School of Medicine, Dept. of Pharmacology, New Orleans, La.).
(American Society for Pharmacology and Experimental Therapeutics, Chicago, Ill., Apr. 12-18, 1964, Paper.)
Biochemical Pharmacology, vol. 14, 1965, p. 67-71. 10 refs.
Grant No. NsG-346.

Inquiry into the localization of thiethylperazine (TPZ) among cerebellar areas in an investigation of the possible correlation between sites of action and concentration among phenothiazines. Qualitative and quantitative determinations of the presence of the drug in lingula, flocculus, nodulus, uvula, posterior cortex, and fastigial nucleus, as well as in restiform body and area of the vestibular nuclei, were made 5, 15, 30, 45, 60, and 90 min after intravenous administration of the drug. The flocculus and nodulus never demonstrated detectable drug. The cerebellar cortex and lingula exhibited low concentrations, and the fastigial nucleus, restiform body, and vestibular nuclear area exhibited highest concentrations. The last three areas named are generally concerned with cerebellovestibular fibers, and this may be indicative regarding the mechanism of action of this drug. (Author) R. A. F.

A65-33034 #
ON THE ROAD FROM THE EARTH TO THE MOON - A BIOLOGICAL EVALUATION OF THE RADIATION HAZARDS OF SPACE FLIGHTS [NA TRASSE ZEMLIA-LUNA - BIOLOGICHESKAIA OTSENKA RADIATSIONNOI OPASNOSTI KOSMICHESKIKH POLETOV].
V. V. Antipov, M. D. Nikitin, and P. P. Saksonov.
Priroda, vol. 54, Apr. 1965, p. 46-53. In Russian.

Discussion of the radiation hazards of a manned flight to the moon, in the light of the latest experimental studies and data collected in Soviet manned orbital flights. Specific topics include the primary cosmic rays, the radiation belts around the earth, the radiation from flares in the solar chromosphere, and radiobiological effects. V. Z.

A65-33150 #
CLOSED ECOLOGICAL SYSTEMS.
William J. Oswald, M. Asce, Clarence G. Golueke, and Donald O. Horning (California, University, Berkeley, Calif.).
(American Society of Civil Engineers, Environmental Engineering Conference, Salt Lake City, Utah, May 11, 1964, Paper.)
American Society of Civil Engineers, Sanitary Engineering Division, Journal, vol. 91, Part 1, Aug. 1965, p. 23-46. 25 refs.
Research supported by the University of California; Contract No. AF 19(628)-2462.

Evaluation of closed ecological systems, which will be required for long term life support on extended space voyages. A closed system is defined, and essential environmental conditions are stipulated, including physiological and psychological factors. Waste handling methods are discussed, together with the current status of various disposal processes. A miniature closed ecological system termed the "Microterella" is described, as is the "Algatron," a specialized algal cultural system. B.B.

A65-33278
PHARMACEUTICALS IN SPACE MEDICINE.
Charles A. Berry (NASA, Manned Spacecraft Center, Houston, Tex.).
(American Pharmaceutical Association, Annual Meeting, New York, N.Y., Aug. 4, 1964, Paper.)
American Pharmaceutical Association, Journal, vol. NS5, July 1965, p. 358-360, 378, 379. 6 refs.

Discussion of pharmaceuticals suitable for allaying fatigue and other symptoms resulting from the effects of prolonged weightlessness, blast-off and reentry stresses, and the other environmental stresses to which astronauts are subjected. Injectors capable of dispensing their contents through a pressure suit and into the thigh of an astronaut are described followed by a description of a newly developed pill case for oral use by subjects handicapped by heavy gloves. The types of pharmaceuticals to be carried on the Apollo lunar mission are listed. Pharmaceuticals suitable for extending the performance capabilities of astronauts on prolonged missions are discussed; analeptics such as the amphetamines are cited as useful stimulants and the use of hypothermia to reduce metabolism and thus diminish oxygen and food consumption is mentioned. Administration of hypnotics is not considered advisable in view of the resultant performance decrement. D. P. F.

A65-33279
ROLE OF PSYCHOPHARMACOLOGY IN SPACE MISSIONS.
Richard Trumbull (U.S. Navy, Office of Naval Research, Psychological Sciences Div., Washington, D.C.).
(American Pharmaceutical Association, Annual Meeting, New York, N.Y., Aug. 4, 1964, Paper.)
American Pharmaceutical Association, Journal, vol. NS5, July 1965, p. 363-365, 380, 382. 21 refs.

Review of the symptoms which weightlessness and a space environment may cause and a consideration of the various drugs which may be used to counteract their effects. Major problems, as indicated by past experience, are related to motion sickness, vigilance maintenance, work-rest cycles, and mood and compatibility. The changes developed by Titov in the cardiovascular and respiratory systems were expressed as dizziness, nausea, and other symptoms (motion sickness). There is seen to be reason to believe that under conditions of weightlessness the latent period for the development of motion sickness lasts much longer than under ground conditions. It is also noted that the reliability of visual information is degraded in space by the constantly varying environmental conditions. The role of certain drugs in stimulating recovery from these and other results of long periods without sleep or excessive work loads is discussed; methedrine (1-1/2 times as effective as benzedrine), mephentermine, and amphetamine are among those mentioned. D. P. F.

A65-33280
BIOLOGICAL CONSIDERATIONS OF MANNED FLIGHT IN SPACE.
Ashton Graybiel (Alabama, University, University, Ala.).
(American Pharmaceutical Association, Annual Meeting, New York, N.Y., Aug. 4, 1964, Paper.)
American Pharmaceutical Association, Journal, vol. NS5, July 1965, p. 368, 369, 375.

Discussion of the conditions prevalent in space, particularly, radiation and weightlessness and their effects on human subjects, and a description of symptoms caused by temporary and prolonged exposure to angular velocities in a slow-rotation chamber. It is found that, in general, it is in the final rather than the initial phase of space missions that conditions are more stressful, hazardous, and difficult. The radiation danger resulting from the reduction in the shielding effect of the geomagnetic field caused by solar storms is noted, and in this connection, the results of Soviet investigations and of the MA-9 orbital flight are briefly discussed. Experiments were performed on human subjects in a slowly rotating room to simulate the effects of an artificial gravity system, designed to counteract weightlessness. It was found that both temporary and long-lasting syndromes were caused by such rotation, due to its effect on the semicircular canals. D. P. F.

A65-33281
BIOMEDICAL INSTRUMENTATION IN SPACE MEDICINE.
Robert F. Shaw (Columbia University, Biomedical Engineering Laboratory, New York, N.Y.; Presbyterian Medical Center, Institute of Medical Sciences, Technical Development Laboratory, San Francisco, Calif.).
(American Pharmaceutical Association, Annual Meeting, New York, N.Y., Aug. 4, 1964, Paper.)
American Pharmaceutical Association, Journal, vol. NS5, July 1965, p. 370-372, 379. 6 refs.

Description of several devices for use in bioinstrumentation of space medicine and a general discussion of this field which has for its objectives the acquisition of reliable and critical data regarding human physiological performance. Ultimately such instrumentation should be able to acquire sufficient data not only to evaluate the state of astronaut well-being but to permit diagnosis of the causes of physiological degradation. The cardiovascular, the respiratory, and the sensory-neuromotor systems are the most important for astronaut performance. A description is given of a two-transducer pulsed-Doppler configuration under development which is designed to measure volumetric blood flow; the pulse-mode transducer monitors blood vessel diameter while the Doppler-mode transducer measures blood flow velocity. An instrument for measuring the exact O_2 content of arterial blood, using a dime-sized external transducer, is described. D. P. F.

A65-33390
LIFE SUPPORT'S NEW TWISTS.
Ronald G. Neswald.
Space/Aeronautics, vol. 44, Aug. 1965, p. 70-78.

Review of present concepts for life support systems, ranging from stored oxygen supply to the current families of partially regenerative systems, and beyond. The first orbiting laboratories are to be very conservative in design of their water and CO_2 systems. Present CO_2 absorption systems use LiOH, but regenerable absorbers are being actively studied. Among possible multifunction processes are electrodialysis to remove CO_2 and to generate oxygen, and direct electrolysis by bubbling CO_2-laden air through a bath of molten alkali-oxide. A solid-electrolyte process system capable of supporting the CO_2-O_2 balance of a man is under examination, using a set of tubes made of yttrium oxide/zirconium oxide (an electrically conductive ceramic with electrodes on inner and outer walls). To remove the carbon from CO_2, various "gardens" - either of the hydroponic variety or of algae systems - have been tried experimentally, but results are considered to have been disappointing. To replace algae, a nonphotosynthetic organism is being studied which can thrive in slightly modified urine and other wastes. Because it furnishes water instead of oxygen, an electrolytic or an electrodialytic cell must be incorporated in the system. Simple air evaporation from wicks is considered as a form of water reclamation. Methods of coping with spacecraft atmospheric contaminants are discussed. The "Thomas Domes" constructed by Aerospace Medical Research Laboratories to study animals exposed to a variety of pressures and atmospheric compositions are given attention. Nitrogen is considered vs helium as an oxygen diluent. F. R. L.

A65-33405
DELAYED RADIATION EFFECTS IN ABDOMEN-IRRADIATED RATS.
S. Tom Taketa (NASA, Ames Research Center, Moffett Field, Calif.).
New York Academy of Sciences, Annals, vol. 114, Mar. 31, 1964, p. 328-334.

Discussion of results obtained in animals irradiated only in the abdomen. Two series of studies were conducted: (1) involving exposure of the intact abdomen to 850 rads, and (2) exposure of the abdomen exclusive of the gastrointestinal tract (which was surgically exteriorized and shielded with lead during exposure) to 1300, 3500, or 5000 rads. In both cases, the head, forelegs, and thoracic area were shielded during irradiation. The delayed mortality patterns in the two groups of 30-day survivors were compared, and a readily apparent similarity of the curves is noted. Death in both groups commenced during the fifth post-exposure month and about 80% of the animals had died by the time the experiment was terminated in the sixteenth month. The mean survival times (MST) of the decedents were 10.4 and 10.8 months for the nontreated and treated groups, respectively. It is noted that similar delayed mortality patterns were reported by Dunjic, et al (1960). M. M.

A65-33501 #
TRENDS IN BIOENGINEERING.
Richard L. Bell (Washington, University, Dept. of Chemical Engineering, Seattle, Wash.) and Ray T. Oglesby (Washington, University, Dept. of Civil Engineering, Seattle, Wash.).
Trend in Engineering, vol. 17, July 1965, p. 5-9, 31. 11 refs.

Discussion of the role of the engineer in regard to the biological sciences. A brief historical survey is given, and the state of bioengineering at the University of Washington is discussed. Finally, trends in bioengineering education are noted. B. B.

A65-33527
CHEMICAL AND METABOLIC CHANGES OF HEPATIC LIPIDS FROM RATS EXPOSED TO CHRONIC RADIAL ACCELERATION.
D. D. Feller, E. D. Neville, and E. G. Averkin (NASA, Ames Research Center, Physiology Branch, Moffett Field, Calif.).
Society for Experimental Biology and Medicine, Proceedings, vol. 119, 1965, p. 522-525. 8 refs.

Investigation of the changes in the liver metabolism of rats subjected to near-tolerance limits of high-g environments obtained by centrifuging, for extended periods of time. A 10-arm radial centrifuge with an 8.5-ft radius was used to simulate a force of either 3.6 or 4.7 g and was run continuously except for the time required for servicing and weighing. The period of high-g exposure varied from 12 to 15.5 months. After an injection of Nembutal, approximately 1 gm of liver was removed, chopped up, and incubated with a buffer medium to maintain pH at 7.4. Lipid extraction was carried out and the nonsaponifiable lipids were extracted three times with hexane. Fatty acids were extracted with fresh aliquots of the same solvent after acidification with 6N HCl. The results showed that prolonged centrifugation of rats did not affect the incorporation of acetate into fatty acids but did affect its incorporation into unsaponifiable liquids. D. P. F.

A65-33554 #
WATER RECOVERY BY MEMBRANE PERMEATION.
J. J. Konikoff (General Electric Co., Missile and Space Div., Re-Entry Systems Dept., King of Prussia, Pa.) and R. A. Miller (General Electric Co., King of Prussia, Pa.).

(AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS AND NASA, MANNED SPACE FLIGHT MEETING, 3RD, HOUSTON, TEX., NOVEMBER 4-6, 1964, TECHNICAL PAPERS. AIAA Publication CP-10.)
Journal of Spacecraft and Rockets, vol. 2, Sept.-Oct. 1965, p. 793-795. 6 refs.
[For abstract see Accession no. A65-10696 01-05]

A65-33615
ENVIRONMENTAL CONTROL.
C. D. King (General Dynamics Corp., General Dynamics/Convair, San Diego, Calif.).
Space/Aeronautics, vol. 44, no. 2, 1965, p. 122-126.

Review of various techniques of environmental control in spacecraft cabins. An oxygen-regeneration system based on a three-step process and designed to meet the demands of a four-man crew on missions lasting up to one year is described. In this system, a CO_2 concentrator is used in which zeolite beds alternately adsorb and desorb CO_2, while beds of silica gel dry the air before CO_2 adsorption. In the electrolysis unit of this system, ion-exchange membranes are used to ensure liquid-gas separation. Catalytic burning and adsorption by activated charcoal are suggested as methods of removing atmospheric trace contaminants. Problems connected with the control of temperatures and heat transfer are discussed, and special mention is made of the desirability of recovering and reusing so-called "process heat." A. B. K.

A65-33702
FACTORS AFFECTING FATTY ACID SYNTHESIS IN CELL-FREE PREPARATIONS FROM SACCHAROMYCES CEREVISIAE.
David White and Harold P. Klein (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Biochemical and Biophysical Research Communications, vol. 20, no. 1, 1965, p. 78-84. 16 refs.
Public Health Service Grant No. H-2421.

Investigation of the mechanism of fatty-acid synthesis in yeast preparations for the purpose of demonstrating that these preparations are subject to controlling influences by certain intermediates of the oxidative and fermentative metabolism of glucose. Saccaromyces cervisiae, Strain LK2G12, was grown, aerated, and disrupted in an Aminco French pressure cell. After centrifugation the solution was dialyzed in a 0.1 M potassium phosphate buffer, pH 6.5, containing 5×10^{-4} M reduced glutathione. This preparation was used in all the experiments. Citrate and L-a-glycerophosphate greatly increased the rate of incorporation of acetate into fatty acids. Experiments indicated that the mechanism of stimulation by L-a-glycerophosphate is not by reversal of the acyl-CoA inhibition. The site of stimulation appears to be the carboxylation of acetyl-CoA. Palmityl-CoA inhibited both fatty-acid and nonsaponifiable lipid synthesis. D. P. F.

A65-33814
A PHYSICAL BASIS FOR LIFE DETECTION EXPERIMENTS.
J. E. Lovelock.
Nature, vol. 207, Aug. 7, 1965, p. 568-570. 9 refs.
Grant No. NsG-199-62.

Theoretical study of extraterrestrial life detection. The difficulty of an adequate definition of life is emphasized, but it is considered possible to design simple experiments for a general recognition of life phenomena by accepting a limited phenomenological definition of life. Three ways this might be accomplished are described: (1) a search for order in chemical structures and sequences of structure by means of a simple gas chromatograph; (2) order in molecular weight distributions (polymers of biological origin have sharply defined molecular weight, inorganic polymers do not); and (3) looking and listening for order. Use of differential thermal analysis, in connection with the first method is suggested. M. L.

A65-33947
PRECIPITATION OF SALMON SPERM DEOXYRIBONUCLEIC ACID WITH PURINE-SPECIFIC ANTIBODY.
H. H. Weetall and N. Weliky (California Institute of Technology, Jet Propulsion Laboratory, Space Sciences Div., Pasadena, Calif.).
Nature, vol. 207, Aug. 21, 1965, p. 858-860. 12 refs.

Experimental investigation of the reactivity of DNA with antibody. In attempting to detect and isolate DNA using immunoadsorbents, it is found that salmon sperm DNA reacts with anti-purinoyl antibody to some extent without heat denaturation and to a greater extent after heat denaturation. Data concerning the quantitative precipitin reaction curves for antiserum are presented. It is found that the reactivity of the DNA appears to be dependent on the ease, degree, and irreversibility of DNA denaturation. It is concluded that the results are consistent with the DNA model in which the bases are hydrogen-bonded within the double helix and consequently are relatively inaccessible to antibody except at the recording system using a strain gage coupled to an amplifier and recorder. It is pointed out that the need for such a system was dictated by the physical limitations of an orbiting capsule, and that the unit is being used in experiments testing the effects of light-dark cycles on the leaf movements of pinto bean plants. The circuit diagram of the system is presented, as well as data concerning the testing and calibration of the system. As compared with corresponding readings on a kymograph attached to the same leaf, deviations of as much as 5° in the strain-gage readings are concluded to be not large enough to invalidate strain-gage records for cycle-length studies. M. L.

A65-33948
RECORDING LEAF MOVEMENTS WITH A STRAIN GAUGE.
T. Hoshizaki (California, University, Center for Health Sciences, Brain Research Institute, Space Biology Laboratory, Los Angeles, Calif.) and K. Yokayama (NASA, Ames Research Center, Moffett Field, Calif.).
Nature, vol. 207, Aug. 21, 1965, p. 880, 881.
Grants No. NSG-528; No. AF AFOSR 246-63.

Account of the devising of a small, lightweight leaf-movement recording system using a strain gage coupled to an amplifier and recorder. It is pointed out that the need for such a system was dictated by the physical limitations of an orbiting capsule, and that the unit is being used in experiments testing the effects of light-dark cycles on the leaf movements of pinto bean plants. The circuit diagram of the system is presented, as well as data concerning the testing and calibration of the system. As compared with corresponding readings on a kymograph attached to the same leaf, deviations of as much as 5° in the strain-gage readings are concluded to be not large enough to invalidate strain-gage records for cycle-length studies. M. L.

A65-34083
COMBUSTION OF DIFFUSION-PUMP FLUIDS IN OXYGEN ATMOSPHERES.
C. W. Solbrig (Illinois Institute of Technology, Chicago, Ill.) and W. E. Jamison (Illinois Institute of Technology, Research Institute, Chicago, Ill.).
Journal of Vacuum Science and Technology, vol. 2, Sept.-Oct. 1965, p. 228-233.

Determination of the ignition characteristics of five commonly used pump fluids in pure oxygen atmospheres at low pressures in combustion-bomb experiments. The results were verified in tests in diffusion-pumped systems. Spontaneous ignition studies were conducted with DC-705, DC-704, Convalex 10, Convoil 20, and tricresyl phosphate in the temperature range 600 to 900°F at pressures from 0.01 to 400 torr, and concentrations from fuel rich to fuel lean. Verification tests were conducted with DC-705, DC-704, and Convalex 10 in a 6-in. diffusion-pumped system by pressurizing the system to 8 psia with pure oxygen and observing for spontaneous and spark-initiated combustion. Additional verification tests with DC-705 and DC-704 were conducted in a 35-in. diffusion pump. (Author) M. M.

A65-34200
DECOMPRESSION SICKNESS AND ITS MEDICAL MANAGEMENT.
Fritz M. G. Holmstrom (USAF, Systems Command, Aerospace Medical Div., Arctic Aeromedical Laboratory, Fort Jonathan M. Wainwright, Alaska) and David H. Beyer (USAF, 551st Hospital, Otis AFB, Mass.).
Military Medicine, vol. 130, Sept. 1965, p. 872-877. 23 refs.

Definition of aviator's decompression sickness and discussion of data on the incidence of neurocirculatory collapse, including a description of the mission and function of the USAF School of Aerospace Medicine Decompression Sickness Management team. The composition and operational procedures of the team are reviewed. Compression to an absolute pressure of 6 atm is recommended as the preferred treatment. The incidence of post-decompression neurocirculatory collapse (USAF) by year, 1950 to 1963, is tabulated. M. M.

A65-34269
MANUFACTURE OF OXYGEN FROM LUNAR MATERIALS.
S. D. Rosenberg, G. A. Guter, and F. E. Miller (Aerojet-General Corp., Chemical Products Div., Azusa, Calif.).
(New York Academy of Sciences, Conference on Geological Problems in Lunar Research, New York, N. Y., May 16-19, 1964, Paper.) New York Academy of Sciences, Annals, vol. 123, July 15, 1965, p. 1106-1122.

Experimental investigation of the feasibility of extracting oxygen from lunar surface materials. It is noted that while the nature of the materials of the lunar surface is not precisely known, it is generally agreed that the surface and immediate substrate are composed of metallic silicates, and that these silicates are widely distributed and fairly easy to obtain. Experimental data are presented for a cyclic, chemical process that is said to produce oxygen from silicates regardless of their precise composition and fine structure, while avoiding the dependence on the presence of water or water precursors in the lunar materials. However, it is expected that the process will produce water as a by-product if water, in any form, is present in the lunar materials. The process consists of three essential steps: (1) reduction of natural silicates with methane to form carbon monoxide and hydrogen; (2) reduction of the carbon monoxide with hydrogen to form methane and water; and (3) electrolysis of water to form oxygen and hydrogen. The equations of the major reactions involved are presented, as well as discussions of each of the three steps. Diagrams and photographs of the equipment used are included. Definitive data on silicate reduction with methane have not yet been obtained; the major problems encountered are the design, fabrication, and stability of the gas-inlet tube for the introduction of the reducing gas to the molten silicate maintained at 1800°C. M. L.

A65-34271
INVESTIGATION OF WATER EXTRACTION PROCESSES FOR USE ON THE MOON.
A. E. Wechsler, P. E. Glaser, and A. E. Germeles (Arthur D. Little, Inc., Cambridge, Mass.).
(New York Academy of Sciences, Conference on Geological Problems in Lunar Research, New York, N. Y., May 16-19, 1964, Paper.) New York Academy of Sciences, Annals, vol. 123, July 15, 1965, p. 1148-1159. 19 refs.
Contract No. AF 19(628)-3279.

Theoretical study of possible lunar water extraction processes. The types of water deposits expected on the moon are briefly discussed, and two types of water extraction processes for these deposits are considered - in situ processes and processes using mined deposits. Energy requirements and water production rates for several processes are presented, and the engineering problems imposed by the lunar environment are discussed. M. L.

A65-34474
BIOCHEMICAL FUEL CELL DEVELOPMENT TEST.
G. V. Colombo and T. J. Hooper (Douglas Aircraft Co., Inc., Missile and Space Systems Div., Advanced Biotechnology Dept., Santa Monica, Calif.).
IN: SPACE ELECTRONICS SYMPOSIUM; PROCEEDINGS OF THE JOINT AMERICAN ASTRONAUTICAL SOCIETY AND AEROSPACE ELECTRICAL SOCIETY MEETING, LOS ANGELES, CALIF., MAY 25-27, 1965. [A65-34466 22-07]
Edited by C. M. Wong.
New York, American Astronautical Society, 1965, p. III-1 to III-16. 6 refs.
Research sponsored by the Douglas Independent Research and Development Program.

Description of an experimental program for the study and development of a total microbiological waste management system. Within this closed waste-degradation water-recovery unit, electrochemically active fuels will be generated by the metabolic activity of an activated sludge culture. The system will be closed by the addition of strains of sewage algae which supply the oxygen for these metabolic oxidations. The electrical energy derived from this process will be employed for additional waste degradation by a direct electrolysis unit. Engineering and experimental results derived from the study of the waste reactor-fuel cell converter are summarized, and the principal design factors incorporated into the laboratory converter are described. F. R. L.

A65-34475
A COMPARISON OF USA AND USSR LIFE SUPPORT SYSTEMS.
Thomas B. Weber (Beckman Instruments, Inc., Fullerton, Calif.).
IN: SPACE ELECTRONICS SYMPOSIUM; PROCEEDINGS OF THE JOINT AMERICAN ASTRONAUTICAL SOCIETY AND AEROSPACE ELECTRICAL SOCIETY MEETING, LOS ANGELES, CALIF., MAY 25-27, 1965. [A65-34466 22-07]
Edited by C. M. Wong.
New York, American Astronautical Society, 1965, p. III-17 to III-23.

Comparative description of the means and techniques used by the US and the USSR to sustain and protect their astronauts during space voyages. Physical layout, radiation shielding, and heat-exchange methods used in the Mercury and early Gemini flights are compared with those of the Vostoks and the earlier Voskhods. The differences in concept and operation between the US one-gas and the Soviet two-gas atmospheres are described. Ground-based simulatio studies in such areas as atmospheric mixtures, dietary and psychomotor changes, and maintenance problems are considered. It is considered to be extremely difficult to critically analyze and compare the two approaches, because of the great difference in data available and of misinterpretation in the translation of key elements in the data released by the Soviets concerning their system. R. A. F.

A65-34476
IMPEDANCE PNEUMOGRAPHY.
Allan F. Pacela.
IN: SPACE ELECTRONICS SYMPOSIUM; PROCEEDINGS OF THE JOINT AMERICAN ASTRONAUTICAL SOCIETY AND AEROSPACE ELECTRICAL SOCIETY MEETING, LOS ANGELES, CALIF., MAY 25-27, 1965. [A65-34466 22-07]
Edited by C. M. Wong.
New York, American Astronautical Society, 1965, p. III-25 to III-32. 23 refs.

Study of impedance pneumography as a useful although indirect technique for measurement of respiratory volume and rate. Impedance pneumography offers the significant advantages of not encumbering, restraining, or disturbing the subject. Of the two most commonly used electrode lead connections, the sternal lead is not useful for aerospace monitoring, due to nonlinearity. The trans-thoracic lead, on the other hand, is useful as it presents a linear calibration over a wide range of respiratory volume. The calibration of the trans-thoracic lead does depend on body position and breathing mode and varies from subject to subject. However, with a precalibrated subject and with restricted body position, the trans-thoracic lead can yield useful volumetric results during physiological monitoring. M. F.

A65-34477
DESIGN AND TEST OF ATMOSPHERE SUPPLY SYSTEM FOR A MANNED SPACE CABIN SIMULATOR.
J. K. Jackson (Douglas Aircraft Co., Inc., Missile and Space Systems Div., Advanced Biotechnology Dept., Life and Environmental Systems Branch, Santa Monica, Calif.).
IN: SPACE ELECTRONICS SYMPOSIUM; PROCEEDINGS OF THE JOINT AMERICAN ASTRONAUTICAL SOCIETY AND AEROSPACE ELECTRICAL SOCIETY MEETING, LOS ANGELES, CALIF., MAY 25-27, 1965. [A65-34466 22-07]
Edited by C. M. Wong.
New York, American Astronautical Society, 1965, p. III-33 to III-44.
Research sponsored by the Douglas Independent Research and Development Program.

Control of atmospheric gas supply for a manned space cabin simulator by use of a breadboard system built from commercially available components. This system supplies oxygen for crew consumption and leakage, as well as an inert diluent gas, which furnishes a suitable atmosphere for extended manned space missions. It is concluded that (1) the system can control a space cabin atmosphere for long durations, (2) it is operable over a range of set points of oxygen partial pressure and absolute pressure, (3) nitrogen or other diluent gases may be used without system modification, (4) pulse control performs a valuable function by indicating total use of each gas and deviations from predicted average use, and (5) the system can be readily integrated with cryogenic storage of atmospheric gases. F.R.L.

A65-34478
REGENERATIVE CARBON DIOXIDE REMOVAL SUBSYSTEM.
John F. Reed and Andrew D. Babinsky.
IN: SPACE ELECTRONICS SYMPOSIUM; PROCEEDINGS OF THE JOINT AMERICAN ASTRONAUTICAL SOCIETY AND AEROSPACE ELECTRICAL SOCIETY MEETING, LOS ANGELES, CALIF., MAY 25-27, 1965. [A65-34466 22-07]
Edited by C. M. Wong.
New York, American Astronautical Society, 1965, p. III-45 to III-56.

Design and fabrication of a regenerative carbon dioxide removal subsystem for use in a space cabin simulator test program. One of the major objectives of the program is to use test data obtained from the various subsystems in a computer program, thus upgrading the computer program which is used to optimize environmental control systems for minimum vehicle penalty. The CO_2 removal subsystem was designed with a number of operational modes and flexible operating characteristics not normally designed into a flight-type component. As an example, it is possible to actually change the length of molecular sieve bed used to adsorb carbon dioxide. In this system, carbon dioxide removal is accomplished by circulating cabin air through canisters of silica gel for moisture removal and then through the molecular sieve canister for carbon dioxide removal. Two sets of silica gel and molecular sieve canisters are used, one set performing the absorption function while the other set is being thermally desorbed. Desorbed moisture returns to the cabin while desorbed CO_2 may either be vented to space or stored for later use in an oxygen recovery device. Bed heating or cooling is accomplished by hot or cold heat transfer fluid flowing in coils imbedded in the absorbing material in each bed. An electrical cycle timer controls operation of all valves automatically except those valves used to alter the mode of operation desired. Timing cycles can be varied as desired. Over 1000 hr of operation of the CO_2 removal subsystem in the manned cabin has been accomplished. The CO_2 concentration in the cabin was successfully maintained below the design level for the four-man crew during a complete 30-day continuous test. (Author) F.R.L.

LC ENTRIES

A65-81975
EXAMINATION OF THE COLOR SENSE IN THE NAVY: THE CHROMATOSCOPE EXAMEN DU SENS DE LA COULEUR DANS LA MARINE: LE CHROMATOSCOPE
Mircea Munteanu
Revue Internationale des Services de Santé des Armées de Terre de Mer et de l'Air, vol. 38, May 1965, p. 361-363.

For the determination of color sense, the chromatoscope can be used to test color vision in naval personnel whose duty demands normal color recognition. The results obtained with the chromatoscope have been superior to those gained with pseudo-isochromatic tables. The instrument may also be utilized to determine the color sense of aviators and personnel responsible for deciphering color signals in inclement weather.

A65-81976
CONTROL OF PROTEIN LEVEL OF ALGAE, CHLORELLA.
frieda B. Taub and A. M. Dollar (Wash. U., Coll. of Fisheries, Seattle).
Journal of Food Science, vol. 30, Mar.-Apr. 1965, p. 359-364. 9 refs.

Chlorella Pyrenoidosa No. 71105, grown under limited nitrate conditions (mM NO^{-}_{3} had protein levels of 21-64% of the total dry weight when grown in continuous culture, and only 5-20% protein when grown as stationary cultures. Light limited both the protein fixation and the total production of dry algal tissue. Protein per liter increased with light, but at a slower rate than total dry weight, resulting in yields of greater protein per liter but cells of lower percentage of protein. Up to a limiting concentration of nitrate the algal yield (dry matter) was directly proportional too light received. The conversion of light energy to net chemical energy was between 3 and 13%.

A65-81977
TRANSFER OF TRAINING ACROSS TARGET SIZES.
Ina McD. Bilodeau (Tulane U., New Orleans, La.).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 135-140. 11 refs.

The present paper deals with an instructional manipulation of target size or width of tracking path in a subject-paced tracking task. Experimentors verbally defined the limits of correct responding, the limits varying from treatment to treatment. After extended training under one path width, subject was tested with the same or a different path width. Two experiments completed the nine factorial combinations of the three values of path width used. Transfer of training was positive in all cases, but the amount of transfer declined as the difference between training- and test-target limits increased. Very regular generalizationlike functions were obtained when amount of transfer was plotted against magnitude of the shift in path width; direction of the shift was apparently irrelevant.

A65-81978
RELATIONSHIP BETWEEN STATIC AND DYNAMIC VISUAL ACUITY.
Seymour Weissman and C. M. Freeburne (Bowling Green State U., Ohio).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 141-146. 6 refs.

Research in the area of dynamic visual acuity (DVA) has pointed out a controversy as to the nature of the relationship between DVA and static acuity. This study tried to answer the following questions. (a) Is there a relationship between static acuity and DVA at any speed? (b) If there are relationships at different speeds, are they different kinds of relationships? Thirty women, college students, were given six speed (20, 60, 90, 120, 150, and 180°/sec) and one static measure of acuity. Thresholds for the first 4 speeds were found to show a significant linear relationship with the static acuity thresholds. The relationship disappeared at the two higher speed thresholds.

A65-81979
SHORT-TERM MEMORY UNDER WORK-LOAD STRESS.
Robert Seibel, Richard E. Christ, and Warren H. Teichner (Mass. U., Amherst).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 154-162 7 refs.
Contract US Naval Training Device Center N61339-1303.

Workload stress was manipulated in terms of conditions which determine information input rate and internal processing rate as factors which produce a breakdown in performance as a result of overloading short-term memory. The results suggest that breakdown will not result from high input rates, but rather from high internal processing rates.

A65-81980
VISUOMOTOR ADAPTATION TO DISCORDANT EXAFFERENT STIMULATION.
I. P. Howard, B. Craske, and W. B. Templeton (Durham U., Gt. Britain).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 189-191. 7 refs.

Held and his co-workers (1962) claim that changes in the stimulation of receptors consequent upon self-produced movements (reafference) are essential for the development of visuomoter coordination. Stimulation of receptors in an inactive or passively moved animal (exafference) is claimed not to lead to the development of visuomotor skills. It is suggested that Held did not make any real effort to train his subjects exafferently. In the present experiment, a rod seen through displacing mirrors was moved towards the subject until it hit him. This discrepancy between vision and touch (exafference) was found to lead to some significant adaptation of active pointing towards the real position of targets seen through displacing mirrors.

A65-81981
DISCRIMINABILITY AND SCALING OF LINEAR EXTENT.
C. Douglas Creelman (Toronto U. Ontario, Canada).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 192-200. 13 refs.
Contracts NONR 248(55) and NONR-4010(03).

Dicrimination between lengths of printed lines was measured by four operationally different experimental techniques. Three of the techniques (single stimuli, absolute judgment, and a modification of the method of constant stimuli) yielded psychophysical scales which were consistent with each other and with the theory of signal dectectability (TSD). In the fourth experimental procedure stimuli had unequal a priori probabilities. This produced consistently higher measures of discrimination. A possible explanation for this obtained discrepancy is the lack of long-term learning under this task as opposed to the others. The results extend the applicability of TSD to some further judgment tasks and experimental conditions.

A65-81982
PERCEPTION OF DEVIATIONS IN REPETITIVE PATTERNS.
Cord B. Sengstake (Oregon U., Eugene and Portland).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 210-217.

This is an investigation of the stimulus variables affecting the difficulty experienced by observers in locating deviations in repetitive patterns. Eleven objective variables and seven subjective variables were correlated with the measure of stimulus difficulty, i.e., mean log time required by observers to locate the deviations. A stepwise regression was performed which indicated that five objective and two subjective variables resulted in a multiple R= .827, and the addition of any of the other variables did not significantly increase the predictive ability of the equation. The seven variables that entered the regression equation were discussed in terms of some possible reasons why they were useful in the prediction of stimulus difficulty.

A65-81983
VISUAL FIELD AND THE LETTER SPAN.
Herbert F. Crovitz (Veterans Admin. Hosp. Durham, N.C.) and H. Richard Schiffman (N. C. U., Chapel Hill).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 218-223. 9 refs.

Three experiments tested the relations between monocular or binocular viewing, visual-field placement of stimuli, and interletter spacing in the distribution of errors over letter positions in the letter span. Exposure time was 100 msec. The most important variable in accuracy within the letter span was found to be the relative location of a letter, within the 8-letter line. Errors were fewest for the leftmost letter in the line regardless of variations in absolute retinal locus. These data imply that experiments on the letter span might better be conceptualized as "memory" studies than as "perception" studies.

A65-81984
EXPECTED VALUE AND RESPONSE UNCERTAINTY IN MULTIPLE-CHOICE DECISION BEHAVIOR.
David M. Messick and Amnon Rapoport (N. C. U., Chapel Hill).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 224-230.
Grant No. AF-ASOSR-85-63; and Gen. Foundation of Labor, Tel Aviv, Israel, supported research.

A10-choice decision-making experiment was conducted in which the uncertainty H of subject's response distributions was experimentally determined for each of 4 blocks of 80 trials. A measure of relative efficiency in terms of expected gain which assumes H constant, R_T, was computed for each subject for each block of trials. Analysis indicated that R_T did not depend on H and that it increased slightly but significantly with blocks. The absolute values of R_T were quite close to the maximum in the later blocks, suggesting that when the uncertainty of the responses is accounted for subjects perform the task in nearly optimal fashion. Some implications of these results for "rational" theories of decision making are discussed.

A65-81985
PRIMACY OF A FORM CRITERION IN PERCEPTUAL JUDGMENTS.
Albert S. Rodwan, (Emory U., Atlanta, Ga.).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 231–234. 5 refs.
Grant NSF GB-1249.

Nine subjects were each presented with 100 plane figures and told to assign them to one of two categories: "X" or "Y". These judgments were correlated with judgments of highly similar plane figures which were assigned to "square" or "rectangle" categories. The mean correlation coefficient between the two judgments was .971. The two conclusions were: (a) height-width ratio is a prepotent cue and form is a primary judgment: and (b) the use of the linear discriminant function (LDF) methodolgy is appropriate in discovering the subjective basis of perceptual judgments.

A65-81986
GRADED CONTRAST EFFECTS IN THE JUDGMENT OF LIFTED WEIGHTS.
Vincent Di Lollo and J. A. Casseday (Ind. U., Bloomington).
Journal of Experimental Psychology, vol. 70, Aug. 1965, p. 234–235. Indiana U. supported research.

Six groups of 16 subjects each judged the heaviness of either a heavy series (H) or a light series (L) of weights for either 2, 6, or 10 trials and were then shifted to the opposite series for 15 additional trials. Two nonshifted groups acted as controls. Before the shift, H was judged heavier than L. After the shift, H was judged as heavier by the shift-up groups than by the H controls (positive contrast effect), and L was perceived as lighter by the shift-down groups than by the L controls (negative contrast effect). The magnitude of the contrast effects was directly related to the number of preshift trials, in accordance with predictions from adaptation-level theory.

A65-81987
TIME ESTIMATION AND INCREASES IN BODY TEMPERATURE.
C. R. Bell (London School of Hyg. and Trop. Med., Med. Res. Council Unit, Great Britain).
Journal of Experimental Psychology, vol. 70 Aug. 1965, p. 232–234. 5 refs.

In an attempt to replicate some early experiments which had shown consistent between-subjects changes in time estimation with increases in body temperature, subjects in the present experiments were required to (a) count to 60 at an estimated rate of 1 digit/sec., (b) tap a Morse key at an estimated rate of 3 taps/sec., and (c) judge when a metronome was beating at 4 beats/sec. Body (oral) temperatures were raised by immersion of both legs below the knees in a bath of warm water. These trials were given at each task at three levels of body temperature. The results of the original experiments were not confirmed.

A65-81988
PREVENTION OF HYPERTENSION WITH CHLORPROMAZINE AT HIGH ALTITUDES [PROFILAKTIKA EKSPERIMENTAL'NOI GIPERTONII AMINAZINOM V USLOVIIAKH VYSOKOGORNOGO KLIMATA].
M. A. Aliev (USSR, Acad. of Sci., Kirgis Inst. of Regional Med., Lab. of Pathol. Physiol., Frunze, Kirgis S.S.R.).
Farmakologiia i Toksikologiia, vol. 28, May–Jun. 1965, p.282–284. 6 refs. In Russian.

Intramuscular injections of chlorpromazine in dogs before induced kidney ischemia retarded the appearance of hypertension at high altitudes. At low altitudes such effect was even more pronounced. When chlorpromazine was given after the onset of ischemia the preventive effect was not noted; however, at low altitude some effect was observed. In all cases the effect of chlorpromazine may be explained by suppression of the neurovascular centers located in the reticular formation.

A65-81989
COMPARATIVE RADIOPROTECTIVE EFFECTS OF MERCAPTO- AND INDOLYLALKYLAMINES DURING EXPOSURE TO GAMMA IRRADIATION AND IRRADIATION BY PROTONS OF 660 AND 120 MEV ENERGY [SRAVNITEL'NOE RADIOZASHCHITNOE DEISTVIE MERKAPTO-I INDOLILALKILAMINOV PRI GAMMA-OBLUCHENII I OBLUCHENII PROTONAMI S ENERGIEI 660 I 120 MEV].
V. S. Shashkov, P. P. Saksonov, V. V. Antipov, B. I. Razgovorov, V. S. Morozov, and G. F. Murin.
Farmakologiia i Toksikologiia, vol. 28, May–Jun. 1965, p. 350–351. In Russian.

Intraperitonial injections of cystamine, serotonin, or 5-methoxytryptamine 15–30 minutes before exposure of white mice to lethal doses of gamma radiation or protons carrying energy of 120–660 Mev, protected 50–80% of the animals and prolonged their lives until they succumbed to radiation injury. The protective effect of tryptamine, or 5-oxytryptophane, which is a precursor in the serotonine synthesis, was found to be less than the first three compounds.

A65-81990
THE EFFECT OF ANTIRADIATION DRUGS ON THE MUSCULAR ACTION OF THE SMALL INTESTINE [O VLIIANII PROTIVOLUCHEVYKH PREPARATOV NA MYSHECHNUIU AKTIVNOST' TONKOGO KISHECHNIKA].
L. F. Semenov, R. B. Strelkov, and V. I. Reshetniak-Moiseeva (USSR, Acad. of Med. Sci., Inst. of Exptl. Pathol. and Therapy, Lab. of Radiol., Sukhumi).
Farmakologiia i Toksikologiia, vol. 28, May–Jun. 1965, p. 351–355. 12 refs. In Russian.

Sulfur-containing anti-irradiation agents, such as cystinamine B-mercaptoethylamine, aminoethylisothiuronium thiourea and unithiol, when given in protective doses, produced contraction of an isolated portion of the intestines in guinea pigs. This effect closely approached that produced by acetylcholine. Serotonin and mexamine gave rise to a specific contraction of an isolated portion of the intestine, attenuated by dimedrol (benadryl) and to a lesser extent, by atropine, while hydergine produced almost no such effect.

A65-81991
THE INFLUENCE OF FLASH INTENSITY UPON THE VISUAL EVOKED RESPONSE IN THE HUMAN CORTEX.
W. J. Rietveld and W. E. M. Tordoir (Leydon U., Dept. of Physiol., Psychophysiol. Div., Great Britain).
Acta Physiologica et Pharmacologica Neerlandica, vol. 13, Jun. 1965, p. 160–170.

The influence of flash intensity on the occipitocortical response was studied in two subjects, who had been subjected to similar experiments about two years previously: Electrode positioning and flashing frequency were chosen in such a way that artifacts were excluded. A luminance range extending from 10^{-3} to 10^{+3} mL was covered in 12 steps. At each luminance value, the response to a series of 300 flashes was averaged. Results summarized as follows: (1) The general character of the responses, and the implicit times in particular, are remarkably constant over a two-year period; (2) For some of the response elements (A1') implicit time is independent of luminance; for others (B,E) it decreases with increase of luminance; (3) Of the response elements, only I' shows a systematic increase in depth with increase of luminance. Except at the highest luminance values, a log-log plot of B2-I' peak-to-peak amplitude against luminance is roughly linear.

A65-81992
ACCURACY OF ACTIVE AND PASSIVE POSITIONING OF THE LEG ON THE BASIS OF KINESTHETIC CUES.
Andree J. Lloyd (Ky. U., Lexington) and Lee S. Caldwell (U. S. Army Med. Res. Lab., Fort Knox, Ky.)
Journal of Comparative and Physiological Psychology, vol. 60, Aug. 1965, p. 102–106. 8 refs.

Forty men were studied to determine the accuracy of active and passive positioning of the legs to specified angular positions. Accuracy of positioning was significantly influenced by the mode of movement and by goal positions. The range of greatest accuracy for active movement coincided with the normal walking arc of the lower leg. Thus accuracy of positioning may be best for the condition and in the range of movements in which there has been greater prior practice, or possibly the distribution and rate of firing of the receptors may favor discrimination in this range. These data suggest that the joint receptors not only provide information, but also are a source of potential noise in the afferent system.

A65-81993
RELATION BETWEEN THE CHANGES OF THE ELECTRICAL ACTIVITY OF THE FOREARM MUSCLES AND THE ACRAL VASOMOTRIC REACTION ELICITED BY A DEEP INSPIRATION [K OTAZKE VZTAHU MEDZI ZMENAMI ELEKTRICKEJ AKTIVITY SVALOV PREDLAKTIA A AKRALNOU VAZOMOTORICKOU REAKCIOU PRI HLBOKOM VDYCHU].
K. Fichtel.
Bratislavské Lekárske Listy, vol. 45, 1965, p. 705–711. 13 refs. In Slovak.

The bioelectrical activity of the forearm flexors and extensors of subjects was recorded using a myointegrator. The apparatus records not only local electromyogram, but also the bioelectrical activity integral of all the electrodes applied. The blood supply of the acral skin area was continuously recorded. On request, the subjects performed, at regular intervals of 1–3 minutes, a deep inspiration and expiration. After a deep inspiration a vasomotor reaction occurred with relative constancy in the skin vascular bed of the hand. Only in 23.7% of inspirations, however, an indication of an increase of muscle action potentials was found. As the changes in electrical muscular activity during deep inspiration are very small and not a constant, accompanying phenomenon, one cannot presume that they could exert any influence on the course of the deep-inspiration-elicited blood flow changes in the acral skin region or on the plethysmographically recorded acral volume changes.

A65-81994
PHYSIOLOGICAL ASPECTS OF LOCOMOTION WITH PARTIAL RELIEF OF BODY WEIGHT AND AT DIFFERENT FRICTION WITH GROUND [ASPETTI FISIOLOGICI DELLA DEAMBULAZIONE CON PARZIALE ALLEGGERIMENTO DEL PESO CORPOREO E VARIO ATTRITO CON IL SUOLO].
A. Scano and G. Meineri (Centro di Studi e Ric. di Med. Aeron. e Spaziale, Rome, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 28, Apr.–Jun. 1965, p. 127–133. In Italian.

Experimental studies were carried out regarding human locomotion capability on the lunar surface under simulated gravitational as compared to ground surface conditions. Body weight was compensated by means of an elastic suspension mechanism up to about 1/6 of its normal value, and the subjects were made to walk on a layer of talcum powder about 13 cm. thick. A characteristic walking stance was observed—successive leaps and a kind of waddle due to the lack of friction. The over-all speed was quite low (maximum about 7 km. per hr.). Energy consumption increased up to 65% of one-g values, regardless of ground friction. The values did not change to any remarkable degree, when the body weight was reduced to about 1/20 of its normal value.

A65-81995
5 PHENYL-2 IMINO-4 OXY-OXAZOLIDINE INFLUENCE ON READINESS AND STEADINESS OF MOTOR RESPONSE IN MAN (RELATED TO FATIGUE IN AVIATION DUTIES) [INFLUENZA DELLA 5-FENIL-2 IMINO-4 OSSO-OSSAZOLIDINA (F.I.O.) SULLA PRONTEZZA E COSTANZA DELLA REAZIONE MOTORIA NELL'UOMO (IN RAPPORTO ALL'AFFATICAMENTO DA LAVORO AERONAUTICO)].
E. Bandini (Rimini, Aeroporto, Gruppo Sanitario, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 28, Apr.–Jun. 1965, p. 134–161. 19 refs. In Italian.

Effects on psychomotor response of 5-phenyl-2-imino-4-oxyoxazolidine were studied in 60 subjects divided into 3 groups (jet pilots, technicians, and administrative personnel). The results, in terms of average response, show moderate effectiveness of the drug with regard to speed and regularity of motor reactions to visual and acoustic stimulation. However, the great individual discrepancies, ranging from high positive to negative paradoxical effects, as well as the diversities observed in maximum effect duration, seem to offset the apparent advantages of the drug and counterindicate its use.

A65-81996
pO_2 MEASUREMENT IN VIVO [LA DETERMINAZIONE DELLA pO_2 "IN VIVO"].
L. Bellelli (Ist. Regina Elena per lo Studio e la Cura dei Tumori, Rome, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 28, Apr.–Jun. 1965, p. 162–186. 19 refs. In Italian.

In vivo studies of pO_2 have been made possible in recent times by the refinement of techniques in preparing highly sensitive electrodes introduced directly into the tissues. A review is presented of the history, the theoretical principles involved, and the techniques employed, such as preparation of recessed platinum electrodes, protection of the electrodes against premature increase in resistance (because of the presence of certain chemical elements or radicals), calibration of electrodes against standard ones, and methods of actual measurement. By way of example, the determination of pO_2 in the cerebral cortex of a rat is described and the direct correlation with O_2 breathing demonstrated.

A65-81997
THE SONIC BOOM [IL SONIC BOOM].
R. Caporale (Centro di Studi e Ric. di Med. Aeron. e Spaziale, Rome, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 28, Apr–Jun. 1965, p. 199–212. In Italian.

The physical characteristics, mechanism of formation and propagation, various types (transitory and continuous), and mechanical effects of sonic boom are reviewed and possible means of attenuation outlined. By analogy with the material and physiological damage caused by explosions (such as observed during missile launchings), the author derives an intensity effect scale as follows: 0.2 p.s.—minor damage to persons and structures; 0.4 p.s.i.—tolerance limit for unprotected individuals; 0.75 p.s.i.—limit value for buildings exclusive of glass; 2.0 p.s.i.—limit value for glass-free reinforced buildings. Rupture of the tympanic membrane is the lession most frequently incurred after exposure to sonic boom. In extreme cases, fracture of the ossicles in the middle ear with subsequent hearing damage, or acoustic trauma on the cochlear level have been recorded, as well as occasional vestibular disturbances. Rubber ear plugs provide almost total protection.

A65-81998
REPORT ON A FLIGHT IN A SUPERSONIC PLANE [RELAZIONE SU UN VOLO SU APPARECCHIO SUPERSONICO].
A. Gubernale (Aeron. Mil., Ist. Med. Legale, Rome, Italy).
Rivista de Medicina Aeronautica e Spaziale, vol. 28, Apr.–Jun. 1965, p. 213–218. In Italian.

The author describes personal observations made during a flight in a TF 104 G at a maximum speed of 1.35 Mach (maximum elevation, 45,000 feet; outside pressure, 111mm. Hg; and temperature $-56.5^{\circ}C$.; inside cabin pressure 368 mm. Hg). The passing of the sound barrier was hardly perceived (minute pressure increase on the ears and face), and accelerations up to 3 G involved in the required maneuvers were well tolerated. The overall experience is noted to have been satisfactory.

A65-81999
THE EFFECT OF SPACE FLIGHT FACTORS ON SEEDS OF SPINDLE TREES (EVONYMUS EUROPAEA L.) [VLIIANIE FAKTOROV KOSMICHESKOGO POLETA NA SEMENA BERESKLETA (EVONYMUS EUROPAEA L.)].
N. I. Nuzhdin, R. L. Dozortseva, N. A. Pastushenko-Strelets, and N. S. Samokhvalova (USSR, Acad. of Sci., Inst. of Genet., Moscow).
Izvestiia Akademii Nauk SSSR, Seriia Biologicheskaia, no. 4, Jul.–Aug. 1965, p. 576–580. 19 refs. In Russian.

Air-dried seeds of Evonymus europaea L. previously irradiated with Co^{60} gamma-rays in doses of 10 kr. and nonirradiated ones were put on board the spacecraft "Vostok 5" during its spaceflight. Part of the seeds, left behind at Moscow, served as controls. The frequency of cells with chromosome aberrations was studied in root tips grown from both the space-exposed and the control seeds. It was found that in the nonirradiated seeds carried into space the number of cells displaying abnormal mitoses was greater than in the controls. In the seeds that had been gamma-irradiated prior to spaceflight, differences were found only between those exposed to space and the controls left in Moscow. Seeds previously irradiated with gamma-rays and subsequently taken into space showed greater occurrence of cells displaying abnormal mitoses than nonirradiated seeds taken into space.

A65-82000
AIRLINE LANDING ACCIDENTS TRENDING DOWNWARD.
Vernon A. Taylor (Flight Safety Found., Inc., New York, N. Y.)
SAE Journal, vol. 73, Sep. 1965, p. 53–55.

Air transport approach and landing accidents appear to be occurring less frequently and causing fewer fatalities. A recent study (1959–1962), compared with an earlier accident report (1946–1958), indicates that this favorable trend is due in part to the introduction of jet transports. Within the approach and landing category, however, accidents due to undershoots, inaccurately assumed positions, and landing gear failures seem to be on the increase.

A65-82001
SPACE GASTROENTEROLOGY: A REVIEW OF THE PHYSIOLOGY AND PATHOLOGY OF THE GASTROINTESTINAL TRACT AS RELATED TO SPACE FLIGHT CONDITIONS.
Carl J. Pfeiffer (NASA, Ames Res. Center, Biotechnol. Div., Moffett Field, Calif.)
Medical Times, vol. 93, Sep. 1965, p. 963–978. 168 refs.

The present review outlines a new area of endeavor, space gastroenterology, which is emerging as a distinct area of concern in the discipline of aerospace medicine. Space gastroenterology is primarily an experimental and preventive medical science dealing with problems of gastrointestinal physiology and pathology during extended space flights where restraint, dietary, radiation, and fatigue factors are exaggerated. The influence on gastrointestinal function and pathology of various stressors which will be encountered during space flight (vibration, gravitational stress, weightlessness, restraint, etc.) are discussed. The time of occurrence, effects, and anticipated problems associated with these various factors in space flight are summarized. In addition, important areas for future space gastroenterologic research are enumerated.

A65-82002
ARTERIAL OXYGENATION DURING HYPOTHERMIA.
J. Hedley-Whyte, H. Pontoppidan, M. B. Laver, P. Hallowell, and H. H. Bendixen (Harvard Med. School, Boston, Mass.)
(Am. Soc. of Anesthesiol., Meeting, Bal Harbour, Fla., Oct. 12, 1964).
Anesthesiology, vol. 26, Sep.–Oct. 1965, p. 595–602. 29 refs.

A significant relationship was found in 10 patients between the tidal volume during constant volume ventilation with 100 per cent oxygen and the rate of increase or decrease of the alveolar-arterial oxygen tension gradient ($AaDo_2$). Tidal ventilation of 7.2 ml./kg. body weight, frequency 20 per minute, gave, on average, a stable $AaDo_2$. This pattern of constant volume ventilation, therefore, apparently prevents increasing atelectasis. For every milliliter that tidal ventilation was below 7.2 ml./kg. body weight, the rate of

increase of the $AaDo_2$ rose an average of 15 mm. of mercury per hour. For every milliliter that tidal ventilation was above 7.2 ml./kg. body weight, the rate of fall of the $AaDo_2$ increased an average of 15 mm. of mercury per hour. hour. This relation between the tidal volume during constant volume ventilation and the rate of change of the $AaDo_2$ was not demonstrably affected by hypothermia per se. This study confirmed the accuracy of factors we had previously proposed, to correct for the effect of temperature on the oxygen tension of fully saturated blood.

A65-82003
MENTAL ACTIVITY AT SLEEP ONSET.
David Foulkes (Wyo. U., Laramie) and Gerald Vogel (Chicago U., Ill.)
Journal of Abnormal Psychology, vol. 70, Aug. 1965, p. 231-243. 28 refs. Grant Natl. Inst. of Mental Health M-04151.

Experimental data, based upon a total of 212 hypnagogic awakenings contributed by 9 subjects, are presented on the incidence of reports of various forms of hypnagogic mentation and on the relationship of such reports to electroencephalographic activity. It was found that mental activity in some form or another was invariable reported throughout the hypnagogic period. Content reported was predominatly visual and lacking in affective intensity and became increasingly hallucinatory and unamenable to voluntary control as EEG patterns shifted from an alpha EEG to a spindling EEG. Dreamlike reports very similar to REM reports (i.e., dramatic, hallucinatory episodes) were quite common during descending EEG Stages 1 and 2, and surprisingly enough, also occurred with an alpha rhythm.

A65-82004
METHOD AND TASK IN MOTOR GUIDANCE.
A. W. Macrae and D. H. Holding (Leeds U., Depts. of Psychol. Great Britain).
Ergonomics, vol. 8, Jul. 1965, p. 315-320. 7 refs. Dept. of Sci. and Indus. res. supported research.

Restriction anf forced-response guidance were used as training methods for two forms of a manual positioning task. The most effective training was given in each case by the guidance technique which most resembled the form of the task to be learned. As in a previous experiment, restriction appeared more effective in a 'push' task. In a modified 'release' task, forced-response appeared the better method. In addition, two groups were given experience of alternative movements as an aid to learning the wanted movement. Although they thus practiced fewer movements of the distance required in the final test neither method became less effective, with the forced-response technique showing some improvement.

A65-82005
THE WORK CAPACITY OF A SYNERGIC MUSCULAR GROUP.
H. Monod and J. Scherrer (C. N. R. S. Lab. de Physiol. du Travail, Paris, France).
Ergonomics, vol. 8, Jul. 1965, p. 329-338. 22 refs.

A new conception of dynamic or static muscular work tests is presented. The authors define the critical power of muscular work from the notions of maximum work and maximum time of work. The work capacity is then considered in the case of dynamic work, and of continuous or intermittent static work. From the data presented it is possible to define the maximum amount of work that can be performed in a given time as well as the conditions of work performed without fatigue.

A65-82006
COMPARISON OF CONVENTIONAL AND DIGITAL TIME DISPLAYS.
C. Zeff. (Loughborough Coll. of Technol., Leicester, Great Britain).
Ergonomics, vol. 8, Jul. 1965, p. 339-345. 5 refs.

An experiment was devised to compare the speed and accuracy of reading the time from possible forms of conventional rotary clocks and digital clocks for both 12-hour and 24-hour displays. Twenty subjects were each presented with96 displays of digital and conventional clocks in a balanced experimental design. The results showed that the speed of reading (for logging to the nearest minute) is three and a half to four times faster with a digital than with a conventional clock. The errors with a conventional clock are ten times those with a digital clock. No significant difference was found between the 0-12 hour and 13-24 hour displays for either the digital or the conventional clock.

A65-82007
ANTHROPOLOGY AND BIOTECHNOLOGY.
Bernard F. Pierce (Gen. Dyn./Astronautics, Life Sci. Sect., San Diego, Calif.)
IN: A SYMPOSIUM ON AEROSPACE ANTHROPOLOGY.
(Am. Anthropol. Assoc., Meeting, San Francisco, Calif., Nov. 24, 1963.)
Phoenix, Ariz., Stein Engineering Services, Inc., 1964, p. 3-7. 21 refs.

The complexity of technological equipment is beginning to exceed human capabilities of compensating for inefficient design. To cope with this dilemma, a new discipline known as biotechnology or human-factors engineering has been developed. Among the problems connected with sending a man into space there are some that are of concern to anthropologists. There are, e.g., anthropometric problems, dealing with differences in stature and proportions of various ethnic groups, as well as demands for designs of flight suit, seats, escape hatches, high-efficiency tools. Dynamic anthropometry deals with the quantitative evaluation of mobility characteristics of full-pressure suits or space suits, and minimal volume requirements of man in space vehicles or space stations. The cultural anthropologist may contribute to the development of a standard symbolic language for an automatic data processing system, or he may relate ethnic factors to the rigorous physical environmental conditions encountered in outer space.

A65-82008
THE ANTHROPOLOGY OF COMMAND CONTROL SYSTEMS.
Robert Emrich (Sys. Develop. Corp., Santa Monica, Calif.)
IN: A SYMPOSIUM ON AEROSPACE ANTHROPOLOGY.
(Am. Anthropol. Assoc., Meeting, San Francisco, Calif., Nov. 24, 1963.)
Phoenix, Ariz., Stein Engineering Services, Inc., 1964, p. 9-11.

A command control system is a complex of men and machines, which collects, interprets, summarizes, and displays information to assist the management of an agency in making decisions. It is the task of anthropology in developing such systems to evaluate the language and cultural heritage in the selection of a design for each system component, in order to establish the most effective man-machine interaction. Physical anthropologists can help fit men into the physical environments of systems in a way which reflects human biology. Linguists may analyze the structural and semantic characteristics of natural languages in order to improve the capacity of a computer and the system as a whole in handling natural language features, and thus to eliminate redundancy in the system. Cultural anthropologists can suggest the adjustments of the system to suit the user's culture.

A65-82009
AEROSPACE ANTHROPOLOGY IN FEDERAL RESEARCH.
Richard G. Snyder (Civil Aeromed. Res. Inst., Oklahoma City, Okla.)
IN: A SYMPOSIUM ON AEROSPACE ANTHROPOLOGY.
(Am. Anthropol. Assoc., Meeting, San Francisco, Calif., Nov. 24, 1963.)
Phoenix, Ariz., Stein Engineering Services, Inc., 1964, p. 13-21. 17 refs.

Currently many anthropologists are employed in various U.S. Government agencies, but only a few take an active part in the aerospace program. However, there are areas in the space program, in which knowledge of anthropology could be utilized in regard to problems connected with adaptation of man to space environments.

A65-82010
THE ROLE OF COMPARATIVE ANTHROPOMETRY IN AEROSPACE ANTHROPOLOGY.
Charles E. Clauser (Aerospace Med. Res. Labs., Wright Patterson AFB, Ohio).
IN: A SYMPOSIUM ON AEROSPACE ANTHROPOLOGY.
(Am. Anthropol. Assoc., Meeting, San Francisco, Calif., Nov. 24, 1963.)
Phoenix, Ariz., Stein Engineering Services, Inc., 1964, p. 23-28. 26 refs.

Reliable anthropometric data may be useful in solving numerous human-factors engineering problems in modern industry, as well as in military and flight programs. Many anthropometric surveys have been conducted in several nations, covering, e.g., U.S. military units; but, the data received have not been fully utilized. Some of the findings have been applied to the Air Force program in designing equipment, pressurized clothing, masks, and other items for better fit and satisfactory physiological protection of about 98% of the Air Force flying personnel.

A65-82011
ANTHROPOLOGY AND MODERN TECHNOLOGY: A SUMMARY OF THE PAPERS.
Lloyd R. Collins (McDonnell Aircraft Corp., St. Louis, Mo.)
IN: SYMPOSIUM ON AEROSPACE ANTHROPOLOGY.
(Am. Anthropol. Assoc., Meeting, San Francisco, Calif., Nov. 24, 1963).
Phoenix, Ariz., Stein Engineering Services, Inc., 1964, p. 29-32.

The author discusses the basic technological unit—the man and the machine—that can be measured in terms of its variables. In aerospace industry the anthropologist can operate through the following procedures: (1) designing the research in terms of a problem statement; (2) examining the technological idea content for a model; (3) defining the independent variables as test parameters; (4) testing a model by instrumentation to obtain measures of independent variables; (5) accepting or rejecting the model according to test results; and (6) testing for applicability within the technological system. The field of aerospace anthropology is as yet not clearly defined and requires new research in the areas of physical and cultural anthropology, and linguistics.

A65-82012
ALTERNOBARIC VERTIGO—A DIVING HAZARD.
Claes E. G. Lundgren (Lund U., Inst. of Physiol., Lab. of Aviation Med., Sweden).
British Medical Journal, vol. 2, Aug. 28, 1965, p. 511–513. 11 refs.

Results obtained from a questionnaire sent to 550 members of the Swedish Association of Sports Divers are reported. The questionnaire was designed to elucidate the frequency of vertigo, the conditions under which it might occur, the possibility that it might interfere with the diver's performance, etc. In an additional inquiry 15 subjects who had vertigo (including some of the most serious cases) were asked to relate their experiences of vertigo on land. Differences in pressure between the middle-ear cavity and the surrounding structures were of paramount importance in the development of diver's vertigo. Since most subjects had vertigo on the way up to or upon reaching the surface it seems that a relative overpressure in the middle ear is an important factor. These conclusions are supported by two observations made by several subjects: (1) that stopping the ascent, and preferably descending again, rapidly alleviated the vertigo; and (2) that the subjects could produce vertigo on dry land by forcing air into the middle ears by blowing against the clamped nose. Vertigo is sufficiently common among divers and potentially dangerous enough to deserve wider recognition. It is suggested that it should be known as alternobaric vertigo. Preventive and therapeutic measures are discussed.

A65-82013
ORGANIC COMPOUNDS IN CARBONACEOUS CHONDRITES.
Martin H. Studier (Argonne Natl. Lab., Chem. Div., Ill.), Ryoichi Hayatsu, and Edward Anders (Chicago U., Enrico Fermi Inst., Ill.)
Science vol. 149, Sep. 24, 1964, p. 1455–1459. 27 refs.
AEC supported research.
NASA Grant NsG-366.

Three carbonaceous chondrites (Orgueil, Cold Bokkeveld, and Murray) were studied by time-of-flight mass spectrometry. These chondrites contain H_2, CH_4, CO, CO_2, NO, N_2, SO_2, and CS_2; benzene, toluene, naphthalene, anthracene, and other aromatics; sulfonic acid esters; and chlorinated hydrocarbons. Ethane and its homolgs are present at $\leq 10^{-3}$ of the abundance of methane. Ammonia was likewise barely detectable. Neither Miller–Urey reactions nor biological processes seem capable of accounting for this distribution, particularly for the high methane-ethane ratio and the preponderance of aromatic hydrocarbons. However, the observed distribution agrees remarkably well with a distribution calculated by Dayhoff and her co-workers for conditions of thermodynamic equibrium in a mixture of carbon, hydrogen, oxygen, and nitrogen at 500^0 K. Apparently the organic compounds in carbonaceous chondrites were formed by equilibrium processes in the solar nebula, after most of the hydrogen had been lost. Some of the prebiological organic matter on the earth may have originated in the same manner.

A65-82014
THE BIOPHYSICAL PROBLEMS OF PHOTOSYNTHESIS.
Roderick K. Clayton (Charles F. Kettering Res. Lab., Yellow Springs, Ohio).
Science, vol. 149, Sep. 17, 1965, p. 1346–1354. 65 refs.

The development of the model of photosynthesis from the revision of the original equation by Van Niel (1935) is reviewed, with an emphasis on biochemical and spectrophotometric experiments. Contemporary thought on the physical problems of photosynthesis is rooted in two premises. The first of these is the idea that the primary photochemical acts are oxidoreductions mediated by chlorophyll in an electronically excited state. The second is the conception of a photosynthetic unit: a photochemical reaction center coupled with an aggregate of "light-harvesting" pigment. This aggregate, composed of various chlorophylls and accessory pigments, has a size ranging from about 50 to 400 pigment molecules for each reaction center. In the reaction center, the central component is a specialized, photochemically active chlorophyll. The energy of light quanta, absorbed anywhere in the ensemble, is delivered efficiently to the reaction center, where the primary oxidoreduction is effected. The primary oxidizing and reducing entities then initiate the biochemical transformations of photosynthesis.

A65-82015
FATTY-TISSUE CHANGES IN RATS WITH ACCLIMATIZATION TO ALTITUDE.
Clark M. Blatteis and Lorenz O. Lutherer (Army Res. Inst. of Environ. Med., Div. of Med. Sci., Natick, Mass.)
Science, vol. 149, Sep. 17, 1965, p. 1383–1385.

Eight adult male rats were exposed to a simulated altitude of 4350 m. for five weeks at 26^0 C.; seven control rats were maintained for five weeks at sea level at 36^0 C. Brown and white fat tissues were excised and weighed. The mean absolute weight of the pooled, well-defined brown-fat pads was greater in the rats acclimated to 4350 m. but the increase was not statistically significant. The expansion of brown adipose tissue in the high-altitude animals was highly significant when related to mean body weights at the time of autopsy; the rats exposed to altitude lost 11% of their weight, while the controls gained 36%. There appeared to be encroachment of new cells of brown adipose tissue into the white fat of the inguinal pad of experimental animals; no such encroachment occurred in the controls. Histological examination of the inguinal pads from the experimental animals indicated an estimated 80% replacement of white-fat fat cells by different cells, which resembled brown-fat cells in certain characteristics. The data suggest that brown fat may be an important factor in acclimatization of the rat to high altitude.

A65-82016
ENERGETICS OF ISOMETRIC AND ISOTONIC CONTRACTION IN ISOLATED VASCULAR SMOOTH MUSCLE UNDER ANAEROBIC CONDITIONS.
Lennert Lundholm and Ella Mohme-Lundholm (Göteborg U., Dept. of Pharmacol., Sweden).
Acta Physiologica Scandinavica, vol. 64, Jul. 1965, p. 275–282. 18 refs.
Swedish State Med. Res. Council and Swedish Natl. Assoc. against Heart and Chest Diseases supported research.

In experiments on isolated bovine mesenteric artery the energy production was determined from the lactic acid production under anaerobic conditions. During isometric contraction of the muscle preparations, addition of adrenaline or of potassium ions resulted in a 3- to 5-fold elevation of the metabolism concomitant with a rise of tension. When the tension had reached maximal level, the metabolic elevation was more moderate—approximately 60% in the experiments with adrenaline and about 20% in those with potassium ions. Thus the muscle consumed more energy in attaining a certain tension level than in maintaining it. Total consumption of high energy phosphate compounds on isometric contraction was estimated to exceed the performed content by approximately 300%. The energy demand was appreciably greater for isometric than for isotonic contraction, both during the increasing tension phase and during maintenance of constant tension. Dibenamine blocked the metabolic stimulating and the contractile effects of adrenaline, but not the effects of potassium ions.

A65-82017
COCHLEAR OXYGEN TENSION: RELATION TO BLOOD FLOW AND FUNCTION.
Michio Tsunoo and Henry B. Perlman (Chicago U., Div. of Otolaryngol., Ill.)
Acta Oto-Laryngologica, vol. 59, May 1965, p. 437–450. 21 refs.
Grant PHS NB-00260. Chicago, U. supported research.

In the normal animal, administration of 100% oxygen, 8% CO_2 or I.V. epinephrine produced increases in perilymph oxygen tension. This value was highest for pure oxygen. Only CO_2 of I.V. epinephrine increased strial blood flow rate and though similar in degree, perilymph oxygen was greater with CO_2 than with epinephrine. With cessation of respiration the oxygen dissolved in the perilymph is exhausted in about 30 sec. Surgical occlusion of the vena aqueductus cochleae results in a drop in perilymph oxygen tension to about 30% of normal along with a marked (90%) reduction in strial flow rate, and about a65% reduction in microphonic output. These low values could be raised, particularly with I.V. epinephrine. The reasons for these findings are discussed.

A65-82018
ERGOGENIC EFFECTS OF BREATHING ARTIFICIALLY IONIZED AIR.
Herbert A. De Vries and Carl E. Klafs (Long Beach State Coll., Calif.)
Journal of Sports Medicine and Physical Fitness, vol. 5, Mar. 1965, p. 7–12. 15 refs.

An experimental design was constructed to evaluate the breathing of negative ions as a practical ergogenic aid, when used immediately preceding an all-out physical performance involving the factors of muscular endurance, cardio-respiratory endurance, and motivation. Forty-five subjects (21 male and 24 female) each acted as his own control in that he was tested on different days following 15-min. exposure to each of the following conditions: (1) breathing negatively ionized air, (2) breathing positively ionized air, (3) placebo (breathing air from a dummy machine), and (4) control (breathing normal ambient room air). Statistical treatment of the data by analysis of variance techniques indicated that although differences in mean bench-stepping time were observed, they did not achieve significance at the .05 level. The mean differences observed for the 24 women subjects were in the direction of the hypothesis that exposure to negative ions would improve physical performance, but also did not achieve significance at the .05 level of confidence. The authors suggest that further experimentation should be undertaken and outline the areas they deem particularly important.

A65-82019
VENTILATION: 1963–64 LECTURES OF THE GREATER BOSTON ANESTHESIA TEACHING CONFERENCES.
John B. Stetson, ed. (Indiana U. Med. Center, Bloomington).
International Anesthesiology Clinics, vol. 3, Feb. 1965, p. 209–375. Many refs.

A review is presented of the chemical control of ventilation, certain aspects of the influence of the level of ventilation on the blood gases, and the effects of the mechanical properties of the lung and thorax on respiratory control. Descriptions of responses of normal and diseased subjects in the above areas are included. Pertinent arcticles are abstracted separately.

A65-82020
REGULATION OF RESPIRATION: SELECTED ASPECTS OF CHEMICAL AND MECHANICAL CONTROL.
John M. Tyler (Lemuel Shattuck Hosp., Med. Serv. Cardiopulmonary Div., Boston, Mass.)
IN: VENTILATION: 1963-64 Lectures of the Greater Boston Anesthesia Teaching Confs.
International Anesthesiology Clinics, vol. 3, Feb. 1965, p. 225-239. 21 refs.
Grants NIH H 3804 and HTS 5379.

A concise review is presented of (1) chemical control of ventilation, (2) certain aspects of the influence of the level of ventilation on the blood gases, and (3) the effects of the mechanical properties of the lungs and the thorax on respiratory control. There is agreement in the literature that the medullary centers are responsive primarily to P_{CO_2} and pH or both, while the chemoreceptor system responds primarily to oxygen lack. The mechanics involved in resistent breathing are analyzed (expiratory and inspiratory muscular work as related to CO_2 tension resulting in diminished response of the respiratory system to CO_2).

A65-82021
A METHOD OF MAXIMALLY ASSISTED VENTILATION.
James O. Elam (Mo. U., Dept. of Anesthesiol., Kansas City).
IN: VENTILATION: 1963-64 Lectures of the Greater Boston Anesthesia Teaching Confs.
International Anesthesiology Clinics, vol. 3, Feb. 1965, p. 297-314.
Contract DA-49-193-MD-2543.

Primarily intended to assist and inform the anesthesiologist, this paper presents a review of general interest on the physiological mechanism and techniques of manual and mechanical ventilation. Among the advantages and disadvantages listed, the following are noteworthy: (1) preservation of continuously evident respiratory activity; (2) enhanced abdominal relaxation; (3) lower airway pressure per liter of alveolar ventilation, especially when negative pressure is applied during expiration; (4) avoidance of excessive pH and pCO_2 changes; some preservation of the physiologic compensation of metabolic acidosis by reduced pCO_2 to elevate pH of the blood; (6) occasional errors in assuming adequate ventilation; (7) occasional causation of excessive alkalosis with resulting reduction in cerebral perfusion; (8) excessive mean airway pressure and occasional reduced venous return; and (9) loss of information feedback regarding short-term respiratory effects of anesthetic and relaxant drugs.

A65-82022
HYPERBARIC OXYGENATION.
L. Rendell-Baker and Julius H. Jacobson, II (Mount Sinai Hosp., New York).
IN: VENTILATION: 1963-64 Lectures of the Greater Boston Anesthesia Teaching Confs.
International Anesthesiology Clinics, vol. 3, Feb. 1965, p. 315-354. 87 refs.

The history of physiological and medical research pertaining to the breathing of oxygen at high pressures (up to 3 atm.) is reviewed. Current applications of hyperbaric chamber treatment have proven themselves in cases of peripheral vascular insufficiency, carbon monoxide poisoning, myocardial infarction, shock, bowel obstruction, sickle cell anemia, emphysema, and others. Future applications include the treatment of extensive burns and of respiratory conditions associated with impaired gas transfer and hypoxia. Among the hazards connected with the use of hyperbaric chambers those of explosions, barotrauma and decompression sickness, nitrogen narcosis, and oxygen toxicity are the most noteworthy.

A65-82023
BONE CONDUCTION AND NOISE MASKING.
Peter B. Weston (Central Inst. for the Deaf, St. Louis, Mo.).
Acta Oto-Laryngologica, Supplementum 204, 1965, 53 p. 20 refs.
Grant PHS NB 03856-03.

The development and evaluation of a method for obtaining monaural thresholds for bone-conducted signals (tones) masked by air-conducted noises. Three experiments investigating the adequacy and usefulness of the method are reported. Experiment I shows that for bone-conducted signals the blocking noise must be both independent of and about 25 db. greater than the masking noise if the masked threshold is to be monaural. Experiment II was conducted to test the hypothesis that the masked thresholds for air conduction are identical for the following three conditions: (1) the usual monaural masked threshold with both signal and noise delivered to the same ear; (2) same as (1) but an independent noise added to the opposite ear at a level 25 db. greater than the masking noise; and (3) same as (2) but with an additional signal, identical in all respects to the original one, introduced into the opposite ear. The hypothesis was confirmed. Experiment III made extensive use of the method for measuring the masking of bone-conducted signals by air conducted noises in a single ear. The results of this experiment are described under the following headings: (a) masking functions, (b) occlusion effect, (c) inconsistencies in threshold data, (d) physical measures of the threshold signals, (e) possible applications of methods and results, and (f) variability of thresholds.

A65-82024
DEPRIVATION OF DREAMING SLEEP BY TWO METHODS. I. COMPENSATORY REM TIME.
Harold Sampson (Mt. Zion Hosp., San Francisco, Calif.).
Archives of General Psychiatry, vol. 13, Jul. 1965, p. 79-86. 23 refs.
Grant Natl. Inst. of Mental Health MH-05723.

The nightly amount of dreaming sleep of six experimental subjects was reduced by two methods - dream interruption and partial sleep deprivation - to determine whether compensatory dreaming sleep could be attributed to dream interruption rather than deprivation. Both methods of reducing dreaming sleep resulted in compensatory rapid eye movement (REM) time on recovery nights, disconfirming the dream interruption hypothesis. The results of the experiment were also consistent with other findings that non-REM sleep tends to take precedence over REM sleep when there has been deprivation of all stages; and a possible special relation of non-REM sleep to the relief of fatigue with its physiologic concomitants was suggested. Individual differences were found in the hierarchy of compensation between REM and non-REM sleep when both were in deficit.

A65-82025
THE DEPENDENCE OF VISUAL SPACE DISCRIMINATION UPON THE AMOUNT OF INFORMATION IN THE STIMULUS [ZAVISLOST PRIESTOROVEJ ZRAKOVEJ DISKRIMINACIE OD MNOZSTVA INFORMACIE PODNETE].
Ivan Sipos (Sav, Ustav expti. psychol., Bratislava, Czechoslovakia).
Studia Psychologica, vol. 7, 1965, p. 20-30. 15 refs. In Czech.

Twelve subjects viewed four series of the Landolt ring presented tachistoscopically. From the first to the fourth series the number of possible gap positions gradually increased from 2 to 4, 8 and 12. Analysis of variance and t-tests confirmed a significant increase of the amount of transmitted information in individual series. There were two different trends in performance where the limits were set by the discriminating ability of the eye on the one hand and by the transmitting capacity of the sensory channel on the other. In the fourth series, a high and significant correlation was obtained between exposure acuity of vision and performance. It is proposed that tests of this type be employed to select individuals from candidates with normal visual acuity for tasks with high visual requirements.

A65-82026
COLLECTION OF AIRBORNE MICROBES BY MEANS OF SIMPLE DEVICES FOR DYNAMIC SAMPLING [IL PRELIEVO DI BATTERI AEROGENI CON SEMPLICI APPARECCHIATURE DI CAMPIONAMENTO DINAMICO].
L. Mammarella (Centro Tec. Chim.-Fis. Biol. dell'esercito, Rome, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 28, Apr.-Jun. 1965, p. 187-198. 7 refs. In Italian.

A microbe sampler is described consisting of a cylindrical container covered by a perforated plate (250 equally distant holes), which is given preference over the so-called "split sampler", which is highly efficient in the collection of very small droplets (about 3μ diameter) but becomes less reliable when the size of droplet increases. While the perforated disk sampler is less selective than the slip sampler, it has proven of greater value in the collection and sampling of larger percentages of bigger particles. A third type of sampler, characterized by a spheric, concave cover is valuable for mass samplings of aerosols and of interest in the prevention of contact infections.

A65-82027
DEHYDROGENASE ACTIVITY OF TISSUES DURING EXPOSURE TO LOW TEMPERATURES AND IONIZING RADIATION [DEGIDRAZNAIA AKTIVNOST' TKANEI PRI DEISTVII NIZKOI TEMPERATURY I IONIZIRUIUSHCHIKH IZLUCHENII].
IU. K. Ledentsov (Sverdlovsk State Med. Inst., Dept. of Biochem., Sverdlovsk, USSR).
IN: VOPROSY EKSPERIMENTAL'NOI I KLINICHESKOI RADIOLOGII (Min. Zdravookhr. RSFSR Sverdlovskii Gos. Med. Inst., sb. trudov, no 39, 1963), p. 66-71. 14 refs. In Russian.

White rats subjected to X-ray irradiation, followed by immersion of the lower limbs in ice-cold water, showed a decrease in the activity of lactic dehydrogenase in the muscle tissue, of glutamine dehydrogenase in the liver, and of succinic dehydrogenase in the brain and muscles. Exposure to low temperatures alone caused an increase in lactic dehydrogenase activity of the brain and liver, indicating a compensatory effect of the chemical phase of the thermoregulatory mechanism, which is suppressed by the action of ionizing radiation. The effect could be due to (1) radiation sensitivity of a compound containing a sulfhydryl group; (2) depletion of the glycogen deposit in the liver and muscles during radiation sickness; (3) decrease of enzyme synthesis because of disturbances of the protein synthesis equilibrium.

A65-82028
CHANGES IN ANIMAL TISSUE VITAMIN CONTENT DURING EXPOSURE TO LOW TEMPERATURE AND IONIZING RADIATION [IZMENENIE VITAMINOV V TKANIAKH ZHIVOTNYKH PRI DEISTVII NIZKOI TEMPERATURY I IONIZIRUIUSHCHIKH IZLUCHENII].
IU. K. Ledentsov (Sverdlovsk State Med. Inst., Dept. of Biochem., Sverdlovsk, USSR).
IN: VOPROSY EKSPERIMENTAL'NOI I KLINICHESKOI RADIOLOGII (Min. Zdravookhr. RSFSR Sverdlovskii Gos. Med. Inst., sb. trudov, no. 39, 1963), p. 82-89. 20 refs. In Russian.

In white rats, subjected to ionizing radiation and local hypothermia, the vitamin content of blood and tissues was not affected to the same degree. This fact may be explained by the difference in the rate of absorption of each vitamin. The changes in the ascorbic acid content of the adrenal glands were of particular interest because it may indicate the degree of recovery of the organism after radiation exposure. After local hypothermia, the ascorbic acid content in the adrenal glands was increased as a result of the increased synthesis triggered by the excessive expenditure of this vitamin in the separation processes. Particularly high concentration (64%) was noted in the muscular tissue. During combined exposure to ionizing radiation and hypothermia, the effect was the opposite, in that the ascorbic acid concentration in the adrenal tissue and in the blood was sharply decreased. The results show that during exposure to ionizing radiation the organism must receive an excessive amount of vitamins (C and B_1) with food.

A65-82029
THE EFFECTIVENESS OF ASCORBIC ACID INJECTIONS AT VARIOUS STAGES OF ACUTE RADIATION SICKNESS [VLIIANIE ASKORBINOVOI KISLOTY V ZAVISIMOSTI OT VREMENI EE VVEDENIIA NA TECHENIE OSTROI LUCHEVOI BOLEZNI].
A. I. Mezentsev and Z. D. Mezentseva (Sverdlovsk State Med. Inst., Dept. of Roentgenol. and Med. Radiol., Sverdlovsk USSR), and L. M. Shabad and M. V. Sviatukhin (USSR, Acad. of Med. Sci., Moscow).
IN: VOPROSY EKSPERIMENTAL'NOI I KLINICHESKOI RADIOLOGII (Min. Zdravookhr. RSFSR Sverdlovskii Gos. Med. Inst., sb trudov, no. 39, 1963), p. 117-125. 19 refs. In Russian.

In white rats, intramuscular injections of 5% ascorbic acid 15-20 minutes before exposure of the animals to ionizing radiation did not affect the degree of radiation damage. Injections of ascorbic acid after exposure to radiation increased the number of surviving animals by about 20%. Treatment after exposure also relieved the gravity of radiation sickness: the animals' hair was smoother; and the diarrhea was less pronounced; the hemorrhages were noted only in the eyelids and in the nasal mucous membranes; the weight loss was reduced; and recovery was faster, as expressed by slight leucocytosis. The results indicate that injections of ascorbic acid cannot be used as a prophylactic measure for radiation sickness.

A65-82030
THE EFFECT OF BONE MARROW AND ASCORBIC ACID INJECTIONS ON THE COURSE OF RADIATION SICKNESS [VLIIANIE TRANSFUZII KOSTNOGO MUZGA V SOCHETANII S ASKORBINOVOI KISLOTOI NA TECHENIE OSTROI LUCHEVOI BOLEZNI].
A. I. Mezentsev and V. D. Tarasenko (Sverdlovsk State Med. Inst., Dept. of Roentgenol. and Med. Radiol., Sverdlovsk, USSR).
IN: VOPROSY EKSPERIMENTAL'NOI I KLINICHESKOI RADIOLOGII (Min. Zdravookhr. PSFSR Verdlovskii Gos. Med. Inst., Trudov. no. 39, 1963), p. 126-130. 9 refs. In Russian.

The treatment of radiation sickness in rabbits by transfusion with suspension of bone marrow in a 5% solution of ascorbic acid was found to be more effective than transfusion of bone marrow suspended in a phosphate buffer mixture. The degree osf sickness was lighter, the hemopoietic system less disturbed, and the recovery proceeding faster.

A65-82031
AIR-CONDITIONING AND HUMAN COMFORT.
Svend Clemmesen, Björn Ibsen, Börge Jensen, Mogens Krogsgaard, and Georg Werner (Kommunehosp., Dept. of Anaesthesiol. and Dept. of Phys. Med., Copenhagen, Denmark)
Medicine and Medicaments Courier, vol. 2, Jan.-Feb. 1965, p. 45-59. 24 refs.

A revision of the principles of air conditioning has been carried out on the basis of the following ideas: (1) At room temperatures between 18 and 28°C., the regulation of body heat takes place, to a very great extent, through variations in the blood flow to the hands. (2) Until now, air conditioning has been based, mainly, on airborne calories and convection and only to a very small extent of radiation possibilities. With room and wall temperatures above 29°C., it is necessary to maintain a rather high ventilation to obtain sufficient cooling of the body, even if evaporation is secured. This high ventilation will be felt as a draught, because of the constant evaporation from the sweating skin. A drying-out of the body takes place and the blood circulation and the functions of the mucous membranes of the respiratory tract are working at maximum, when convection and radiation have been compensated and inhibited. The introduction and application of cooled surfaces in walls or ceilings, kept at temperatures low enough to allow the body to radiate its surplus of heat directly to them, should be of much advantage. Even if the water condensed on these surfaces will, in some places with a high relative humidity, give some technical difficulties, this will contribute to drying the circulated air, and less ventilation will be necessary. The cooling obtained through the cooling of the air by convection and conduction on these cooled surfaces will be of minor influence in the room.

A65-82032
ELECTROENCEPHALOGRAMS OF EPILEPTICS FOLLOWING SLEEP DEPRIVATION.
Richard H. Mattson, Kenneth L. Pratt, and John R. Calverley (Aerospace Med. Div., Wilford Hall USAF Hosp., Dept. of Med., Neurol. Serv., Lackland AFB, Tex.).
Archives of Neurology, vol. 13, Sep. 1965, p. 310-315. 8 refs.

Eighty-nine epileptics patients with normal or borderline resting interictal electroencephalogram (EEG) were subjected to 26 to 28 hours of sleep deprivation. Thirty patients (34%) showed unequivocal activation of spike-wave focal spike or electrographic seizure activity. Of 34 epileptic patients whose initial EEG was abnormal, 19 patients (55%) showed an unequivocal qualitative or quantitative increase of abnormality, and none became more normal. In 20 control patients, the EEGs were unchanged by sleep deprivation. Sampling alone accounted for a small but definite, percentage of the increased abnormality. Sleep did not account for the activation, but in a few cases the EEG abnormalities were most prominent during light drowsiness. Hyperventilation and photic stimulation were important in bringing out abnormalities after sleep deprivation. It appeared that sleep deprivation acted to lower the threshold to elicitation epileptiform activity. It is concluded that sleep deprivation is a valuable supplement in the evaluation of epileptic patients because it helps to bring out the nature and location of epileptiform activity. It is suggested that this may also be a useful technique for evaluating the difficult patient in whom the diagnosis of epilepsy is uncertain.

A65-82033
DECOMPRESSION SICKNESS AND ITS MEDICAL MANAGEMENT: A TEAM APPROACH TO THE STUDY OF AVIATOR'S NEUROCIRCULATORY COLLAPSE.
Fritz M. G. Holmstrom (Arctic Aeromed. Lab., Fort Jonathan M. Wainwright, Fairbanks, Alaska), and David H. Beyer (USAF School of Aerospace Med., Educ. and Training Div., Brooks AFB, Tex.).
Military Medicine, vol. 130, Sep. 1965, p. 872-877. 23 refs.

The USAF School of Aviation Medicine Decompression Management Team, established January 1, 1962, serves as a consultant group in the study and treatment of the neurocirculatory collapse due to decompression sickness seen in airmen. The team is composed of 6 members and their alternates, representing 5 clinical specialties: aviation medicine, internal medicine, surgery, neurology, and pathology. A clinical laboratory officer, a physiologist, and laboratory and electroencephalographic technicians provide the necessary technical support. Compression to 6 atmospheres is recommended as the treatment of choice. Every attempt should be made to move the patient to a treatment chamber as quickly as possible. Such an approach is a logical extrapolation of the well-recognized principle of immediate return to ground-level pressure when symptoms of evolved gas disorders occur in-flight. This approach views decompression neurocirculatory collapse as the most serious of the evolved gas disorders and directs treatment toward removal of embolic gas bubbles, and, secondarily, toward symptom control. Transportation by aircraft equipped with cabins pressurizable to sea level will be required in some cases. Nursing and medical care, as needed, should be continued en route.

A65-82034
CARBON TETRACHLORIDE POISONING [TETRACHLOORKOOLST OF INTOXICATIE].
E. J. Dorhout Mees and M. Van Zoeren (Geneeskundige Universiteitsklin and Mil. Hosp., Utrecht, Netherlands)
Nederlands Militair Geneeskundig Tijdschrift, vol. 18, Jul. 1965, p. 207-212. 9 refs. In Dutch.

Nephrotoxicity of carbon tetrachloride is discussed, illustrated by a case history. A 37 year old man was admitted after an exposure to carbon tetrachloride in a badly ventilated place two days ago. The clinical course was characterized by tubular necrosis with oliguria followed by a late polyuric phase. A complicating factor in the case was a steady use of alcohol which may act as a predisposing factor. Treatment included peritoneal dialysis and artificial kidney. Prompt recognition of the true cause is essential.

A65-82035
ACOUSTIC FACILITATION OF VISUAL DETECTION.
William H. Watkins and Carl E. Feehrer (Electron. Systems Div., Decision Sci. Lab., Bedford, Mass.).
Journal of Experimental Psychology, vol. 70, Sep. 1965, p. 332-333.

Eleven observers were required to judge which of four temporal intervals contained a visual signal, in an experiment involving a total of 10,900 trials Under some conditions, potentially useful time information was conveyed by accompanying sound stimulation, while it was lacking under others. Highest detectability of the signal was associated with an acoustic condition having white noise bursts coincident with each observation interval. Those detection scores were significantly superior to a "reciprocal" condition having the identical amount of acoustic time-specification information. Detection was poorest under continuous noise and silence, which were not discernably different in their effects. Simple time curing was inferred not to provide an adequate explanation for the results.

A65-82036
THE CONTROL OF VERTIGO BY THIETHYLPERAZINE.
Walter H. Johnson and P. E. Ireland (Toronto U., Dept. of Otolaryngol., Toronto, Ontario, Canada).
Archives of Otolaryngology, vol. 82, Sep. 1965, p. 261-266. 7 refs.

Thirteen normal young men ingested different amounts of thiethylperazine up to a maximum of 30 mg. A similar number of placebo pills served as a control, and the experiment was regulated by the well-known "double-blind" procedure. Ninety minutes after ingestion of the pills, the subjects were exposed to either caloric or rotatory stimulation and both their objective and subjective signs of vertigo were recorded. Quantitative analysis of the resulting nystagmograms definitely established that the compound possesses vertigo suppression properties as was evident by diminished nystagmus (by as much as 80%) together with corresponding changes in subjective responses. It is most significant to note that there was complete absence of side effects in all subjects even though the dose was often as much as 30 mg. on an empty stomach. Although it is not the object of this paper to evaluate the effectiveness of the compound in the suppression of nausea resulting from vestibular stimulation, some results from this study indicate that it is valuable for the treatment of motion sickness. Extensive testing of its effectiveness in this condition is underway and will be reported separately.

A65-82037
EXPERIMENTAL MICROWAVE CATARACTS: AGE AS FACTOR IN INDUCTION OF CATARACTS IN THE RABBIT.
Claire A. Van Ummersen and Frances C. Cogan (Tufts U., Dept. of Biol., Medford, Mass.).
Archives of Environmental Health, vol. 11, Aug. 1965, p. 117-178. 12 refs.
Grant PHS GM 09495-03.

Experiments studying whether animal age affects either the latent period for opacity induction by microwave radiation or the extent or type of opacity are reported. Thirty-seven litters of New Zealand white rabbits, comprising 163 animals ranging in age from five weeks to more than a year, were used as subjects. Under pentobarbital sodium anesthesia, the right eye of each animal was positioned two inches opposite the crossover of a dipole antenna delivering 2.5 megacycles radiation (12.3 cm.). In each litter, half of the animals were irradiated for 8 min., a dose determined to be above the cataractogenic threshold for the power employed. The remaining animals were given threshold exposures of 6 min., except in the case of young animals 5 to 7 weeks old, some of which received subthreshold exposures of only 5 min. duration. In each animal, the nonirradiated left eye served as the control. No significant relationship between the age of the animal and the susceptibility of its lens to damage by microwave radiation was demonstrated. Likewise, neither the latent period before appearance of an opacity nor the type of cataracts can be related to the age of the animal.

A65-82038
CATARACT INCIDENCE IN RADAR WORKERS.
S. F. Cleary, B. S. Pasternack (N. Y. U., Inst. of Environ. Med., New York), and G. W. Beebe (Armed Forces Epidemiol. Board, Comm. on Environ. Hyg., Washington, D. C.).
Archives of Environmental Health, vol. 11, Aug. 1965, p. 179-182. 7 refs.
U. S. Army Med. Res. and Develop. Command supported research.

Data readily available in military service records were analyzed to estimate the relative risk of cataract formation associated with military occupational microwave employment. The population sampled consists of Army and Air Force veterans of World War II and the Korean War. The results suggest that occupational exposure to microwave radiation of the power generated by Army and Air Force equipment in World War II and the Korean War did not change the risk of cataract formation in men using such equipment. Adjustment of the relative risk for branch of military service and age had no significant effect on the results of the analysis.

A65-82039
EQUIDISTANCE TENDENCY AND ITS CONSEQUENCES.
Walter C. Gogel (Civil Aeromed. Res. Inst., Oklahoma City, Okla.).
Psychological Bulletin, vol. 64, Sep. 1965, p. 153-163. 51 refs.

The equidistance tendency is the tendency for objects or other inhomogeneities in the field of view to appear at the same distance with the strength of this tendency being inversely related to directional separation. The evidence for the existence of the equidistance tendency and for its ability to modify the perceived depth resulting from size or stereoscopic cues is reviewed. The equidistance tendency is discussed as a disturbing factor in visual experimentation and as a necessary factor in the understanding of Emmert's law, the moon illusion, and similar phenomena. Several possible explanations for the equidistance tendency are evaluated briefly in terms of the range of phenomena with which it is identified.

A65-82040
BELIEF STATES AND THE USES OF EVIDENCE.
Thornton B. Roby (Tufts U., Medford, Mass.).
Behavioral Science, vol. 10, Jul. 1965, p. 255-270. 12 refs.
Contracts ONR 494(15) and AF 19(628) 2450; and Grant NSF G-10947.

The development of a conceptual framework for analyzing cognitions by representing them as probability distributions in a space of possible objective states is attempted. The author believes that there are several potential advantages of this approach; first, it permits quantitative comparison or combination of the measured beliefs of different individuals or of the beliefs of the same person at different times; and second, the effects of external evidence can be described conveniently as mathematical operations on the existing belief state.

A65-82041
EFFECT OF WHOLE BRAIN COBALT-60 GAMMA IRRADIATION ON CORTICAL AROUSAL IN THE BURRO.
P. Naitoh, F. A. Spurrell, and G.T. Heistad (Minn. U., Div. of Vet. Surg. and Radiol. and Dept. of Psychiat., St. Paul and Minneapolis).
Electroencephalography and Clinical Neurophysiology, vol. 19, Aug. 1965, p. 172-181. 16 refs.
Contract AF 29(601)-2160.

The acute effects of single, whole brain, cobalt-60 gamma irradiation on the cortical arousal to the conditioned stimulus (CS) were examined on normal male adult burros up to 7 days following 200 r, 400 r and 600 r. A 200 r irradiation did affect neither the resting patterns of electrocorticograms, nor the CS-induced cortical arousal. Degradation and rapid loss of the CS-induced cortical arousal were observed only if the subjects were irradiated with 400 r or 600 r. Since the 600 r exposed subjects suffered from significant physiological changes and died early of radiogenic neuropathic death, a facilitated extinction of the cortical arousal observed in this group might merely reflect effects of radiation sickness. Collateral data indicated that facilitation of extinction of the CS-induced cortical arousal would not be caused by radiogenic changes in the unconditioned stimulus efficacy and in attention, but difficulties in getting emotion activation in response to learned cues.

A65-82042
EFFECTS OF AN ACUTE INCREASE OF INTRACRANIAL PRESSURE UPON THE ELECTROENCEPHALOGRAM.
William P. Wilson, George T. Tindall, and Joseph C. Greenfield, Jr. (Duke U., Med. Center, Depts. of Psychiat., Surg. and Med., Durham; and Durham Veterans Admin. Hosp., N.C.).
Electroencephalography and Clinical Neurophysiology, vol. 19, Aug. 1965, p. 184-186. 10 refs.
Grant N. C. Heart Assoc. 82-1494.

Continuous electroencephalographic (EEG) tracings were obtained in 10 subjects during acutely induced elevations of the cerebrospinal fluid. Evidence is obtained indicating that such an increase in intracranial pressure, even when superimposed on chronic elevations in pressure, does not alter the EEG pattern. Whether the bilateral slowing is due to distortion of the normal anatomic relationships by the mass, to significant decrease in cerebral blood flow, or to cerebral edema cannot be answered.

A65-82043
AUDITORY ACTIVITY IN UNCROSSED CENTRIFUGAL COCHLEAR FIBRES IN CAT: A STUDY OF A FEEDBACK SYSTEM, II.
Jörgen Fex (Karolinska Inst., Nobel Inst. for Neurophysiol., Stockholm, Sweden).
Acta Physiologica Scandinavica, vol. 64, May–Jun. 1965, p. 43–57. 37 refs.
Swedish Med. Res. Council supported research.

In decerebrate cats, of all of the cochlear efferents except the uncrossed olivo-cochlear fibres were cut, the vestibulo-cochlear anastomosis was exposed through the vestibule and single unit activity was recorded in, and close to the anastomosis with micropipette electrodes. Although the auditory function was destroyed in the dissected cochlea, resting activity was found in primary auditory afferents, suggesting that synaptic mechanisms could still be intact in such a preparation.— Uncrossed olivo-cochlear fibres were activated by electrical stimulation of the ipsilateral cochlear nerve and by acoustic stimulation of the contralateral ear. When activated by sound, the uncrossed efferents in the basal fascicle of the anastomosis generally responded to higher tone frequencies than did fibres in the apical fascicle, which suggests afferents and uncrossed efferents from homotopic cochlear points in opposite cochleae are connected. The fibres responded characteristically with a low regular firing rate without an initial burst and with a long latency at threshold, indicating that their input would be integrated over a considerable time. Many of the efferents showed resting activity which, with few exceptions, could be inhibited by sound depending on the choice of tone frequency.— The findings suggest that the uncrossed cochlear efferents and ipsilateral auditory efferents together form an auditory, closed feedback loop, which is directly influenced by the contralateral ear and support the hypothesis that the uncrossed and the crossed olivo-cochlear bundles together form a complex, auditory feedback mechanism.

A65-82044
THE CIRCADIAN RHYTHM OF SELF-SELECTED REST AND ACTIVITY IN THE CANARY AND THE EFFECTS OF BARBITURATES, RESEPRINE, MONOAMINE OXIDASE INHIBITORS AND ENFORCED DARK PERIODS.
Göran Wahström (Uppsala U., Dept. of Pharmacol., Sweden).
Acta Physiologica Scandinavica, vol. 65, Supplementum 250, 1965, 67 p. 45 refs. Uppsala U., Svenska Sallskapet for Med. Forskning, and Magn. Bergvalls stiftelse, Stockholm supported research.

The mechanisms controlling the self-selected endogenous circadian activity rhythm and rest were studied in canaries. Single doses of monamine oxidase inhibitors decreased activity during the first few days, then increased it. Opposite changes were obtained during the rest period. The effects lasted about two weeks. The increase in activity was more pronounced when the drugs were given in the afternoon. The results indicate a monoaminergic mechanism which is responsible for the division of activity and rest within the circadian period. Slight changes were observed in the waking up time upon normalization, but the clock compensated for them later. The clock, however, could be reset by the enforced period of darkness during the first circadian period without any tendency to disappear for about a week. Waking up and roosting was not controlled in the same manner. The clock can be influenced by other factors, such as thyroid hormones and I^{131}. According to the results obtained by other researchers there are similarities between the self-selected rhythm in humans and canaries.

A65-82045
TOWARD THE EXPERIMENTAL CONTROL OF DREAMING: A REVIEW OF THE LITERATURE.
Charles T. Tart (Stanford U., Lab. of Hypnosis Res., Calif.).
Psychological Bulletin, vol. 64, Aug. 1965, p. 81–91. 96 refs.
PHS supported research.

The study of nocturnal dreaming has been mainly a matter of correlational studies. This article brings together and reviews those scattered studies in which an attempt was made to actively influence dreaming. Despite a great diversity of methods, aims, and results, it is apparent that dreaming can be experimentally manipulated, and thus it may be possible to develop a functional experimental approach in which dreams become more immediate and observable aspects of behavior, rather than only memories.

A65-82046
GRADUAL AROUSAL FROM SLEEP: A DETERMINANT OF THINKING REPORTS.
Arthur Shapiro, Donald R. Goodenough, Helen B. Lewis, and Irving Sleser (N. Y. State U., Downstate Med. Center, Dept. of Psychiat., Psychiat. Treatment Res. Center, and Psychol. Lab., Brooklyn).
Psychosomatic Medicine, vol. 27, Jul.–Aug. 1965, p. 342–349. 17 refs.
Grants NIH MH-03885; MH-05518; and MH-K3-16,619.

Reports that subjects have been "thinking" rather than dreaming are given more often gradual awakenings than after abrupt awakenings. The effect of the method of awakening was relatively pronounced among subjects who rarely recall dreaming (at home) and absent among subjects who usually do. It was also pronounced when subjects were awakened from late rapid-eye-movement periods of the night, and absent for early ones. Some evidence was also found to support the hypothesis that gradual awakenings affect the content of the reported narratives.

A65-82047
SENSITIVITY OF THE BLIND-SPOT REGION TO STIMULATION BY FLICKER.
Ernest Wolf and Anthony J. Morandi (Mass. Eye and Ear Infirmary, Retina Found., Dept. of Ophthalmol. and Inst. of Biol. Med. Sci., Dept. of Clin. Eye Res., Boston; and Harvard Med. School, Boston).
Journal of the Optical Society of America, vol. 55, Aug. 1965, p. 1024–1028. 7 refs.
Grant PHS B-1482.

Flicker functions were obtained with square test fields of 1^0, 2^0, 5^0, and 10^0 angular subtense positioned at the center of the blind spot. When the test fields fell entirely on to the disk, duplex flicker curves were obtained, indicating excitation of adjacent elements by scatter of light. The disk area was explored with small test fields presented in various positions on a vertical and a horizontal line running through the center of the blind spot. A drop in critical flicker frequencies was obtained when the test field fell into the disk area. The possibility of using the decrease in frequency as a measure of retinal dysfunction in scotomata is discussed.

A65-82048
THE SPECTRUM OF ULTRAVIOLET ABSORPTION BY THE BLOOD SERUM AFTER EXPOSURE TO IONIZING RADIATION AND LOW TEMPERATURE [SPEKTRY POGLOSHCHENIIA SYVOROTKI KROVI PRI DEISTVII IONIZIRUIUSHCHIKH IZLUCHENII I NIZKOI TEMPERATURY].
IU. K. Ledentsov and E. N. Borodina (Sverdlovsk State Med. Inst., Dept. of Biochem., Sverdlovsk, USSR).
IN: VOPROSY EKSPERIMENTAL'NOI I KLINICHESKOI RADIOLOGII (Min. Zdravookhr. RSFSR Sverdlovskii Gos. Med. Inst., sb. trudov, no. 39, 1963), p. 90–94. 10 refs. In Russian.

Wavelengths of 285–253 $m\mu$, which lie in the ultraviolet region of the light spectrum, are absorbed by mammal blood serum. This absorption is due to the presence of proteins containing amino acids, tyrosine, and tryptophane, and having a benzol ring. These protein fractions may undergo changes under pathological conditions. Absorption was studied in white rats subjected to ionizing radiation and local hypothermia. The results show that after X-ray irradiation alone, and irradiation combined with hypothermia, the intensity of absorption was decreased. Evidently this decrease was due to a decrease in total blood protein, which leads to a decrease in the number of chromophore groups. However, this may not be the only reason. The ratio of protein fractions, the number of free amino acids, and other factors may also affect the maximum and minimum of absorption.

A65-82049
MORPHOLOGICAL CHANGES OF SKIN DURING EXPOSURE TO LOW TEMPERATURE AND RADIATION [O MORFOLOGICHESKIKH IZMENENIIAKH KOZHY PRI DEISTVII NIZKOI TEMPERATURY I OBLUCHENIIA].
O. V. Kler and IU. K. Ledentsov (Sverdlovsk State Med. Inst., Dept of Histol. and Biochem., Sverdlovsk, USSR).
IN: VOPROSY EKSPERIMENTAL'NOI I KLINICHESKOI RADIOLOGII (Min. Zdravookhr. RSFSR Sverdlovskii Gos. Med. Inst., sb. trudov, no. 39, 1963), p. 95–109. 21 refs. In Russian.

The effect of local hypothermia and ionizing radiation was studied in guinea pigs. The skin at the site of exposure to cold showed hyperemia and edema 24 hrs. after exposure, with later development of small vesicles. At the end of a ten-day period, sloughing of the skin layers was evident. Stained preparations of the sloughed material showed diffuse infiltration of the cortum and the subdermal adipose layers by polymorpthonuclear leucocytes. The blood vessels were dilated with evident hyperemia, and occasional edema of the muscle layers and adventitia were observed. The lymphatic layers were dilated. The epidermis contained vesicles filled with exudates and polymorpthonuclear leucocytes. The epithelial cells showed incomplete staining. The adipose tissue was filled with basophiles. The collagen fiber space was filled with various types of blood cells and macrophages. Areas of necrosis were noted five days after exposure. Regimentation of tissue was noted 10 days after exposure. The results show that the exposure of animals to ionizing radiation before hypothermic exposure did not affect the degree of damage or the regeneration process.

A65-82050
MODIFICATIONS OF TACTILE EVOKED POTENTIALS AT THE SPINAL TRIGEMINAL SENSORY MUCLEUS DURING WAKEFULNESS AND SLEEP.
R. Hernández-Peón, J. J. O'Flaherty, and A. L. Mazzuchelli-O'Flaherty (Inst. de Invest. Cerebrales, A. C., Moras, Mexico).
Experimental Neurology, vol. 13, Sep. 1965, p. 40–57. 41 refs.
Contract DA-ARO-49-092-65-G62.

Sensory transmission at the first synapse of the trigeminal pathway during wakefulness and sleep has been studied by recording tactile evoked potentials in cats with electrodes permanently implanted in the spinal sensory nucleus. The various stages of sleep and wakefulness were assessed behaviorly, and by monitoring the electrical activity of the neocortex, the entorhinal cortex, eye movements and the electromyogram of the neck muscles. It was found that both the presynaptic and postsynaptic components of the

bulbar trigeminal potentials were reduced during alertness, increased during "synchronized" sleep and diminished again during "desynchronized" sleep. All these changes were statistically highly significant. Electrolyte lesions in the midbrain tegmentum eliminated the corresponding sensory regulatory influences yielding remarkably stable potentials of high amplitude. It is suggested that presynaptic and postsynaptic inhibition, arising in the midbrain tegmentaum and acting at the first sensory relay, represents a filtering mechanism preventing interference of the integrative processes involved in sensory perception and dreaming.

A65-82051
INDUCTION OF NITRATE REDUCTASE IN SYNCHRONIZED CULTURES OF CHLORELLA PYRENOIDOSA.
Gjert Knutsen (Bergen U., Dept. of Biochem., Bergen, Norway).
Biochimica et Biophysica Acta, vol. 103, Jul. 15, 1965, p. 495–502. 12 refs.
Norges Almenvitenskapelige Forskningsråd supported research.

Synchronously growing and dividing cultures of the green alga, Chlorella pyrenoidosa, were utilized to study the ability of cells to reduce nitrite after induction of nitrite reductase (NAD) (P) H_2: nitrite oxidoreductase, EC 1.6.6.4). The inducibility was found to vary throughout the life cycle, in a manner similar to the stepwise synthesis of DNA. It was further found that the rate of induction of enzyme-synthetic capability, realizable during a subsequent incubation in the presence of actinomycin D, showed the same close relationship with DNA synthesis as did the inducibility. The data suggest that Chlorella DNA is only available for synthesis of nitrite reductase messenger RNA when it is self-reproducing.

A65-82052
INTRACELLULAR ENZYME CHANGES IN POST-ANOXIC RAT BRAIN.
S-L. Yap and R. G. Spector (Guy's Hosp. Med. School, Paediat. Res. Unit, London, Great Britain).
British Journal of Experimental Pathology, vol. 46, Aug. 1965, p. 422–432. 19 refs. Spastics Soc. supported research.

Unilateral anoxic-ischemic cerebral lesions were induced in adult rats. Losses of succinic, α-glycerophosphoric, lactic, isocitric and malic dehydrogenases, reduced nicotinamide adenine dinucleotide diaphorase, alkaline and acid phosphatases 5-nucleotidase, monoamine oxidase and ribonucleic acid were detected by histochemical methods in the forebrain lesions during the first 24 hr. after the anoxic episode. Within these areas of generalized enzyme loss, neurons which showed the most severe post anoxic change contained increased amounts of acid phosphatase and 5-nucleotidase. From 24 hr. after the anoxia, increased amounts of dehydrogenase, reduced nicotinamide adenine dinucleotide diaphorase, adenosine triphosphatase, acid and alkaline phosphatase, monoamine oxidase and leucine aminopeptidase were detected in large microglia in the hippocampus and insular cortex. Increased amounts of dehydrogenases, reduced nicotinamide adenine dinucleotide diaphorase, adenosine triphosphatase, 5-nucleotidase and cytoplasmic ribonucleic acid were also seen in astrocytes and oligodendroglia in these areas 48 hr. after the induction of the lesions.

A65-82053
MAXIMUM OXYGEN UPTAKE IN MIDDLE-AGED MALES.
William H. Phillips, Frederick W. Kasch, J. E. Lindsay Carter, and William D. Ross (San Diego State Coll. Phys. Educ. Res. Lab., Calif.)
Journal of the Association for Physical and Mental Rehabilitation, vol. 19, Jul.–Aug. 1965, p. 127–129. 15 refs.

A comparative data of oxygen uptake in the maximal work capacity of middle-aged male subjects derived from various studies are presented. Included in the comparison are measurements taken at the San Diego State College in connection with its Adult Fitness Program, currently in its seventh continuous year of operation. Normative data for maximal oxygen uptake are presented in terms of Hull scores using a linear transformation of raw scores to an arbitrary scale with a mean of 50 and a standard deviation of 14. This provides a scale where a range of 1 to 99 accommodates subjects scoring 3.5 standard deviations above and below the mean. Subjects outside this range are thought to be atypical and not likely to be participants in a group training program.

A65-82054
TEN YEARS OF HEARING PROTECTION IN THE ROYAL NETHERLANDS AIR FORCE [TIEN JAREN GEHOORBESCHERMING BIJ DE KONINKLIJKE LUCHTMACHT].
G. Jacobs and A. Westerlaan.
Nederlands Militair Geneeskundig Tijdschrift, vol. 18, Jul. 1965, p. 212–218. 5 refs. In Dutch.

Results of noise protection measures in the Royal Netherlands Air Force applied for the past ten years are surveyed together with new developments in the field. Several tables show the number of personnel involved, the age differences, the hearing losses, and the improvement realized in the course of ten years. Next to noise-research and the definition of acoustical criteria, audiometric control, indoctrination of personnel in noise hazards, and personal noise protection are the chief areas of concern of the Air Force Hearing Conservation Program.

A65-82055
TASK PREDICTABILITY IN THE ORGANIZATION ACQUISITION, AND RETENTION OF TRACKING SKILL.
Don Trumbo, Merrill Noble, Kenneth Cross, and Lynn Ulrich (Kan. State U., Manhattan).
Journal of Experimental Psychology, vol. 70, Sep. 1965, p. 252–263. 25 refs.
Contract AF-AFOSR 62-17.

Two hundred and fifty male students were assigned to four conditions of task predictability, three retention intervals, and two levels of training in a 4 x 3 x 2 design. Predictability was determined by irregular step-function tasks that differed in the proportions of systematically repeating (predictable) targets, ranging from fixed to random sequences. Integrated absolute error served as a performance criterion. In addition, six indexes of temporal-spatial patterning were obtained. Results showed greatest improvement and greatest absolute retention losses for the fixed task and a fixed-direction task added to the design. Intermediately predictable tasks did not differ in error from the random task; however, differences in response organization were found among all tasks. Results suggest the nature of changes in response organization and indicate that timing may be most crucial for acquiring and maintaining skill.

A65-82056
SHORT-TERM, PERCEPTUAL-RECOGNITION MEMORY FOR TACHISTOSCOPICALLY PRESENTED NONSENSE FORMS.
Richard A. Steffy (Veterans Admin. Hosp., Danville, Ill.) and Charles W. Eriksen (Ill. U., Urbana).
Journal of Experimental Psychology, vol. 70, Sep. 1965, p. 277–283. 11 refs.
Grant NIH M-1206; and Veterans Admin. Hosp., Danville, Ill. supported research.

A display consisting of triangular arrangements of three Vanderplas and Garvin nonsense forms was tachistoscopically presented. In the center of the triangle a fourth form (cue) occurred, which was identical to the one of the three, and the best subject indicated which of the three was identical to the cue. Two sequences of presentation were used: cue occurred first followed at delays of 10–700 msec. by the three alternatives; alternatives occurred first followed by the cue. There were two conditions; one where the adapting and delay fields of the tachistoscope were dark, and the other where they were illuminated. Thirty-six subjects were run. For dark-adapting and delay fields impairment in recognition was obtained at delays under 100 msec. for both sequences. A marked superiority of the cue followed by alternatives sequence was found in both conditions. This result was shown to be consistent with findings of other studies on short-term memory.

A65-82057
SIZE CUE AND THE ADJACENCY PRINCIPLE.
Walter C. Gogel (Civil Aeromed. Res. Inst., Oklahoma City, Okla.)
Journal of Experimental Psychology, vol. 70, Sep. 1965, p. 289–293. 13 refs.

The adjacency principle asserts that the dominant cues in the determination of the perceived position of an object in a configuration of objects are the distance cues which occur between it and adjacent, not displaced, objects. The purpose of the present study was to apply this principle to the perception of relative depth from size cues. For this purpose, a visual situation was produced in which the perceived depth position of a playing card would differ depending upon the relative effectiveness of the size cue between this card and other cards. In agreement with the adjacency principle it was found that the size cue between adjacent cards was more effective than the size cue between displaced cards in the determination of perceived relative depth.

A65-82058
SELECTION STRATEGIES IN CONCEPT ATTAINMENT AS A FUNCTION OF NUMBER OF PERSONS AND STIMULUS DISPLAY.
Patrick R. Laughlin (Northwestern U., Evanston, Ill.)
Journal of Experimental Psychology, vol. 70, Sep. 1965, p. 323–327. 6 refs.

The selection strategies of individuals and two person cooperative groups were investigated in 5 concept-attainment problems. Two types of stimulus displays were used: (a) form displays, consisting of geometric forms varying in 6 attributes with 2 levels of each, (b) sequence displays, consisting of 6 plus and/or minus signs in a row. The arrangement of cards in the stimulus displays was ordered or random. The principal results were: (a) two person groups used the focusing strategy more, required fewer card choices to solution, and required more time than individuals: (b) form displays resulted in more use of the focusing strategy than sequency displays, with no difference in number of card choices; (c) no difference between ordered and random arrays in use of the focusing strategy or number of card choices.

A65-82059
PROBLEMS IN THE MEASUREMENT OF SPEECH DISCRIMINATION.
Raymond Carhart (Northwestern U., Med. School., Dept. of Otolaryngol. and School of Speech, Evanston, Ill.).
(Otosclerosis Study Group and Comm. on Conserv. of Hearing, Joint Session, AAOO, Chicago, Oct. 18, 1964).
Archives of Otolaryngology, vol. 82, Sep. 1965, p. 253–260. 22 refs.
Contract AF 41(657)-418; and Grant Natl. Inst. of Neurol. Diseases and Blindness K6 NB 16,244-02.

A number of monosyllabic word tests designed to measure discrimination for speech are available today. The clinician must be clear as to the purpose for which he is measuring discrimination. He must choose both the test to use and the method for administering it so as to satisfy his purpose. Different criteria apply when a test is used in the diagnosis of auditory pathology and in determination of site of lesion than when it is used in estimating either the efficiency of hearing in everyday life or the potential value of a rehabilitative procedure such as a hearing aid. Finally, the clinician must remember that existing tests for speech discrimination are imperfectly standardized and lack validation. They have qualitative usefullness today, but with appropriate revision they can become much more definitive clinical tools.

A65-82060
TOWARD A THEORY OF OPEN AND CLOSED GROUPS.
Robert C. Ziller (Del. U., Newark).
Psychological Bulletin, vol. 64, Sep. 1965, p. 164–182. 71 refs.
Contract AFOSR 62-95.

Four characteristics differentiate groups in which membership is in a constant state of flux (open groups) as opposed to groups in which the membership is relatively stable (closed groups): time perspective, equilibrium, frame of reference, and changing groups membership. The significance of these characteristics for social behavior was explored. A number of tested and testable propositions concerning group stability and social behavior emerged from a raprochement of research, relevant subtheories, and concepts associated with open- and closed- group behavior. The failure to consider the dimension of group stability in most previous social- psychological research poses a question concerning the generality of social- psychological theories which are based upon research which ignores the pervasive dimension group stability.

A65-82061
MICROWAVE CATARACTOGENESIS.
H. S. Seth and S. M. Michaelson (Rochester U., School of Med. and Dentistry, Dept. of Radiation Biol., N. Y.)
Journal of Occupational Medicine, vol. 7, Sep. 1965, p. 439–442. 9 refs.
Contracts AF 30(602)-2248 and AEC W-7401-ENG-49.

The eyes of rabbits were exposed to 2800 Mc./sec. continuous microwave radiation at flux densities of 160–240 mw./sq. cm. Exposures lasted 10–60 min. Lenticular changes in the form of rapid and complete opacification developed after exposure to 220–240 mw./sq. cm. for 1 hour. Transient intumescence of the lens fibers was apparent at the lower exposure levels. Daily exposures for short periods did not produce any cumulative effect.

A65-82062
FUNDAMENTAL CONSTRAINTS TO SENSORY DISCRIMINATION IMPOSED BY TWO KINDS OF NEURAL NOISE.
John L. Stewart
Behavioral Science, vol. 10, Jul. 1965, p. 271–276. 8 refs.
U.S. Dept. of State and AF Systems Command supported research.

Noise in the channels worsens the performance of any system that discriminates among various patterns of information input and there are multiple sorts of noise in the sensory pathways of animals. Is it possible that such a system can carry out sensory recognition as effectively as electronic devices? This article, written from the viewpoint of information engineering, concludes that, if the animal system incorporates certain constraints it can be a nearly ideal sensory discriminator.

A65-82063
SPONTANEOUS SLOW MODULATION OF FLICKER-EVOKED RESPONSE IN HUMAN BRAIN.
Arnold Trehub (Veterans Admin. Hosp., Northampton, Mass.)
Electroencephalography and Clinical Neurophysiology, vol. 19, Aug. 1965, p. 182–184.

Specific frequency components of the flicker- evoked response of the visual cortex were recorded by means of narrow pass- band filters. During presentation of photic stimulation, all subjects showed an augmented cortical output at the frequency of stimulation with waxing and waning of amplitude envelope of the filtered output. Analysis of inter- trough durations in the amplitude envelope of the filtered cortical output revealed a systematic distribution of activity cycles. Under the resting condition, cycles of activity ranged from 1 to 5 sec. with 1 sec. dominant. Under the stimulus condition, cycles of activity at the frequency of stimulation ranged from 1 to 7 sec. with 2 sec. dominant. The rise and fall in amplitude of various concurrent frequency components of the electroencephalogram either at rest or under flicker stimulation was neither synchronous nor reciprocal. It is considered unlikely that the reported spontaneous cycles of filtered cortical output are the result of either a process exercising general modulatory control of visual system or of beats between frequencies of flicker- evoked activity and endogenous activity.

A65-82064
INSTRUMENTS FOR DETECTING LIFE.
William R. Corliss.
IN: SPACE PROBES AND PLANETARY EXPLORATION.
New York, D. Van Nostrand Co., Inc., 1965, p. 477–502. 25 refs. NASA supported research $7.50.

This handbook of technical information on space and planetary exploration, spacecraft design, communications, guidance, and scientific instruments in space is intended for use by engineers and others engaged in space exploration, ventures. Pertinent to aerospace medicine is Chapter 16, in which are reported techniques for the detection and study of life on other planets. Instruments to be used for the detection and study include infrared and mass spectrometers, television, radio listening, chromatographs, and ultraviolet spectrophotometers. Biological experiments should include the determination of staining properties, reduction- oxidation potentials, bioluminescence and optical rotary dispersion, plus microscopic observation and metabolism detection by means of radioisotopes. Life detection and study may be done by either remote analysis or by sample analysis.

A65-82065
SUPRASPINAL CONTROL OF THE INTESTINO- INTESTINAL INHIBITORY REFLEX.
Borje Johansson, Olof Jonsson, and Bengt Ljung (Goteborg U., Dept. of Physiol., Sweden).
Acta Physiologica Scandinavica, vol. 63, Apr. 1965, p. 442–449. 17 refs.
Contract AF-EOAR 61-47; and Grants PHS HE-05675-03 and Swedish Med. Res. Council F 0028-B-A.

Experiments were performed on chloraloseurethane- anesthetized, vagotomized cats. Changes in the level of adrenomedullary hormones were prevented. Distension of a segment of distal jejunum produced a prompt decrease in tone and rhythmicity in the proximal jejunum. This so- called intestino- intestinal inhibition is a propriospinal reflex response apparently mediated by sympathetic efferents. Electrical stimulation in the mediocaudal part of the rhomboid fossa was found to 'block' this spinal intestino- inhibitory reflex. The fact that bulbar stimulation alone sometimes produced an increase in gut motility seemed to be due to suppression of a prevailing activity in the propriospinal reflex. When there was a low level of such activity medullary stimulation per se had little or no effect on intestinal motility. It is suggested that the supraspinal structures exert an inhibitory influence on impulse transmission in the propriospinal intestino- inhibitory reflex area.

A65-82066
ON THE COMPETITION BETWEEN METABOLIC VASODILATATION AND NEUROGENIC VASOCONSTRICTION IN SKELETAL MUSCLE.
I. Kjellmer (Goteborg U., Dept. of Physiol., Sweden).
Acta Physiologica Scandinavica, vol. 63, Apr. 1965, p. 450–459. 12 refs.
Goteborg U., Svenska idrottens vetenskapliga Forskningsrad supported research.
Contract AF EOAR 61-47; Grant PHS HE-05675-03.

Using a plethysmographic method combined with the recording of blood flow and, at times, recording of the volume of blood in the calf of the cat with an isotope technique, the responses of the resistance vessels, of the capillary filtration coefficient, and of the capacitance vessels were studied when the vessels were subjected to the antagonistic influences of muscular exercise and vasoconstrictor fiber activity. At higher frequencies of stimulation, sympathetic activation caused an equally marked reduction of blood flow during exercise and during rest. But during exercise the response of the resistance vessels subsided within a few minutes to become steady at a level only a little above starting level despite continued stimulation. The capillary filtration coefficient, already increased during exercise, was affected, and then increased still further only when the sympathetics were stimulated at frequencies which impeded blood flow markedly. Sympathetic stimulation during exercise increased the tone of the capacitance vessels - a response that did not weaken at all so soon as that of the resistance vessels. It is concluded that the resistance vessels and particularly the precapillary sphincters are more sensitive to vasodilator metabolites locally released during exercise than to the vasoconstrictor fibre supply, while the reverse is true for the capacitance vessels.

A65-82067
THE POTASSIUM ION AS A VASODILATOR DURING MUSCULAR EXERCISE.
Ingemar Kjellmer (Göteborg U., Dept. of Physiol., Sweden).
Acta Physiologica Scandinavica, vol. 63, Apr. 1965, p. 460-468. 15 refs.
Göteborg U. and Svenska Idrottens vetenskapliga forskningsråd supported research.
Contract AF EOAR 61-47; Grant PHS HE-05675-03.

Calf muscles of cats were perfused with blood at constant flow rates. Tissue volume, blood flow, arterial and venous pressures were measured. Exercise was imitated by intermittent contractions of the muscles. During contractions the potassium concentration of the venous plasma from the calf increased by up to 100 per cent. Potassium salts infused intra-arterially at low rates dilated the vessels. It was calculated that the potassium released during exercise directly explains 25 to 65 per cent of the dilatation during exercise, the percentage being smallest when dilatation was slightest. There is presumably a diffusion gradient for potassium between tissue and blood with consequent underestimation of the role of the potassium ions, particularly when the dilatations are only weak. Therefore, 65 per cent probably comes closest to the true value of the proportion of the dilatation due to the potassium ions. Potassium infusions produced the same vascular response as exercise; a decrease of flow resistance was accompanied by a proportionate increase of the capillary filtration coefficient without signs of an increase in capillary permeability or dilatation of the capacitance vessels. Potassium is the only dilative substance hitherto found to produce exactly the same response as exercise.

A65-82068
ON THE MUCUS FLOW RATE IN THE HUMAN NOSE.
Gösta Ewert (Karolinska Sjukhuset, Dept. of Otolaryngol.; and Karolinska Inst., Dept of Hyg., Stockholm, Sweden).
Acta Oto-Laryngologica, Supplementum 200, 1965, 62 p. 113 refs.

A quantitative method was developed by the author for observation of the mucous flow rate in the human nose. The study was conducted on normal subjects under various levels of relative humidity. The flow rate was significantly correlated to the relative humidity of the ambient air. Above 70% relative humidity, mucous flow could be seen in all observed cases, but below that level, cessation of the flow was observed in an increasing number of cases. Smokers show a lower rate than nonsmokers. In tracheostomized patients the flow rate was considerably higher. The results showed the fundamental influence of relative humidity of the respired air on the muscous flow rate in the nose: an overall optimal flow rate could be noted in the saturated air. A general high flow rate requires a well-developed ciliary epithelium and cannot be expected to occur by simply elevating the ambient relative humidity.

A65-82069
STUDIES ON EXERCISE HYPEREMIA.
Ingemar Kjellmer (Göteborg U., Dept. of Physiol., Sweden).
Acta Physiologica Scandinavica, vol. 64, Supplementum 244, 1965, 27 p. 38 refs. Göteborg U. and Svenska Idrottens vetenskapliga forskningsråd supported research

The nature and cause of local circulatory adjustments to changes in muscular activity were studied in cats, with a plethysmographic technique, sometimes combined with isotope methods. The exercise reduced the blood flow resistance in various degrees according to the severity of the exercise and increased the capillary pressure, which led to an increase in outward filtration. The capillary permeability did not change. The increased capillary filtration coefficient must, therefore, be ascribed to the opening of the precapillary sphincter with an increase in the surface area available for the exchange between blood and tissue. The blood flow to the muscle is determined mainly by the metabolic requirements, while pooling of blood in the active muscle is prevented by nervous activity. The net filtration of fluid from blood to tissue is greater than the lymph flow. This inflow results in an accumulation of fluid in contracting muscles. The potassium ions released from the intracellular space reach high concentrations and may contribute to vascular dilation.

A65-82070
THE STEADY STATE AND ENDOGENOUS RESPIRATION IN NEURON AND GLIA.
Holger Hydén and Paul W. Lange (Göteborg U., Med. Fac., Inst. of Neurobiol., Sweden).
Acta Physiologica Scandinavica, vol. 64, May-Jun. 1965, p. 6-14. 18 refs.
Natl. Multiple Sclerosis Soc., New York and Torsten and Ragner Soderberg's Found. supported research.
Grant AF EOAR 62-29.

The oxygen consumption of individual, surviving nerve cells and glial cells was studied for two hour periods. An extrapolation procedure was worked out which permitted the determination of the oxygen consumption rate in the steady state in vivo and the substrate amount for endogenous respiration. The oxygen consumption rate of the neurons exceeded that of the glia by at least ten times in the steady state. The values obtained were used for calculation of the amount of glucose per nerve cell, which was found to be 5 per cent of the dry weight of the cell corresponding to a 70 mM glucose solution. The amount of glucose in glia is 5 to 10 times lower than that of nerve cells. Addition of glucose or beta-hydroxybutyrate to nerve cells having respired without exogenous substrate for two hours highly increased the respiration rate. In neurons with increased RNA synthesis and respiratory enzyme activities, the respiration rate and substrate level were low.

A65-82071
ON THE EFFECT OF THE PUPILLARY DIAMETER ON CORTICAL POTENTIALS EVOKED BY LIGHT FLASHES [UBER DEN EINFLUSS DES PUPILLENDURCHMESSERS AUF DIE DURCH LICHTBLITZE AUSGELOSTEN KORTIKALEN POTENTIALE].
F. Klingberg and L. Pickenhain (Karl-Marx-U., Neurol. Psychiat. Klin., Leipzig, East Germany).
Acta biologica et medica germanica, vol. 13, 1964, p. 636-638. 6 refs.
In German.

Seven male albino rats with implanted epidural electrodes were stimulated with stroboscopic light flashes. Parameters investigated included electroencephalograms, motor activity, respiration, and behavioral observations. Evoked cortical potentials were unipolarly recorded from the occipital and temporal cortex. Results obtained before and after atropinization of eyes (Homotropin) were compared. No significant differences were uncovered in the form or amplitude of the evoked cortical potentials. Pupil width remained without effect also at different frequencies of light flashes (1 to 12 per sec.).

A65-82072
RESPONSES EVOKED BY STIMULATION OF THE ACOUSTIC PATHWAY DURING THE SLEEP-WAKEFULNESS CYCLE.
N. Dagnino, E. Favale, C. Loeb, and M. Manfredi (Genova U., Clin. delle Mal. Nervose e Mentali, Genova, Italy).
Experimentia, vol. 21, Aug. 15, 1965, p. 459-460.

Changes were studied of the evoked responses in the acoustic pathway of 14 cats during periods of the sleep-wake cycle. Responses evoked in the auditory cortex by stimulating the acoustic radiations and the inferior quadrigeminal brachium (IQB) were recorded as well as responses evoked on the acoustic radiations by stimulating the IQB. Cortical response on arousal from light sleep showed significant amplification, but a larger increase in response amplitude occurred during deep sleep. After arousal from this deep sleep, responses were reduced greatly. Responses of the acoustic radiations were increased during deep sleep and arousal cortical response after acoustic radiations stimulation were reduced significantly during light and deep sleep. It is concluded that the main changes in the acoustic pathway are reduced cortical responses and increased geniculate transmission. It is suggested that cortical responsiveness with pre-geniculate stimulation in deep sleep is due to facilitated geniculate transmission. This in turn could mean that cortical reduction with pre-geniculate stimulation during arousal from light sleep is cortical in origin.

A65-82073
RATE OF CHANGE OF CARBON DIOXIDE TENSION IN ARTERIAL BLOOD, JUGULAR VENOUS BLOOD AND CISTERNAL CEREBROSPINAL FLUID ON CARBON DIOXIDE ADMINISTRATION.
R. D. Bradley, S. J. G. Semple, and G. T. Spencer (St. Thomas's Hosp. Med. School, Depts. of Anaesthesia and Med., London, Great Britain).
Journal of Physiology, vol. 179, Aug. 1965, p. 442-455. 18 refs.

The rate of change in carbon dioxide pressure (P_{CO_2}) in arterial and jugular vein blood and cisternal cerebrospinal fluid was measured following 5% CO_2 administration in patients undergoing encephalography. Ventilation was maintained throughout the procedure. The rise of P_{CO_2} in the blood and cerebrospinal fluid was exponential. The rise in the arterial P_{CO_2} in all experiments consisted of a fast component with time constants varying between 0.2 and 0.9 min. and a slow component with time constants varying between 6.7 and 14.7. The rise in jugular vein P_{CO_2} and cerebrospinal fluid P_{CO_2} consisted of only one component. The time constants for the changes in jugular venous blood were 2.1, 3.8 and 4.3 min., while in the cerebrospinal fluid they varied between 6.7 and 14.7. It is probably that about 40% of the increase in ventilation following CO_2 administration is due to stimulation of an area in the anterolateral surface of the medulla sensitive to changes in pH or P_{CO_2}. This area is superficial, and ventilation is affected by changes in the P_{CO_2} of the overlying cerebrospinal fluid. This may explain the slow rise in ventilation on CO_2 breathing when compared with the rate of rise of arterial and jugular venous P_{CO_2}.

A65-82074
A COMPARISON OF THE EFFECTS OF OSCILLATING AND STEADY ALVEOLAR PARTIAL PRESSURES OF OXYGEN AND CARBON DIOXIDE ON THE PULMONARY VENTILATION.

D. J. C. Cunningham, D. H. Elliott, B. B. Lloyd, J. P. Miller, and J. M. Young. (U. Lab. of Physiol., Oxford, Great Britain).
Journal of Physiology, vol. 179, Aug. 1965, p. 498–508. 28 refs.

The effect on pulmonary ventilation of induced breath-by-breath oscillations in alveolar– carbon dioxide pressure (P_{A,CO_2}), in alveolar oxygen pressure (P_{A,CO_2}) or in both simultaneously was studied in resting normal human subjects. The experiments were done against a background of substantial hyperpnea induced by hypercapnia and moderate hypoxia. Since ventilation was high, breath-by-breath alternation of inspired mixtures produced large and rapid changes of alveolar partial pressures. During the oscillations, mean P_{A,CO_2} and P_{A,O_2} were determined by slow end-tidal sampling. The ventilations observed during the oscillations of P_{A,CO_2} and P_{A,O_2} were compared with the total ventilation (V) predicted for the observed mean P_{A,CO_2} and P_{A,O_2} from the measured steady-state V, P_{A,CO_2} P_{A,O_2} relation. No systematic differences were found. The results are discussed in relation to current reports in the literature of the efficacy of oscillating signals in stimulating ventilation.

A65-82075
THE SPATIAL PROPERTIES OF THE HUMAN ELECTRORETINOGRAM.
G. S. Brindley and G. Westheimer (Calif. U., School of Optometry, Neurosensory Lab., Berkeley).
Journal of Physiology, vol. 179, Aug. 1965, p. 518–537. 12 refs.
Contract Nonr 222(82); and Grant NIH NB 03154.

A technique was developed for recording the electroretinogram of any small region of the human retina. Responses to stray light are suppressed by steady illumination of the whole retina outside the geometrical image of the stimulus. The technique is easily capable of detecting the blind spot, and of examining the electrical response to a stimulus of 2° diameter centered on the fixation point. For stimuli larger than several square degrees, the electroretinogram shows exact spatial additivity. On a finer scale it is at least roughly additive. The foveal electroretinogram differs in shape from the extrafoveal. The electroretinograms of different regions of the extrafoveal retina differ greatly one from another in their amplitude per unit area of retina, but little if at all in their shape.

A65-82076
SOME PROBLEMS OF PHYSIOLOGICAL MEASUREMENTS IN THE INTERPLANETARY FLIGHTS [NEKOTORYE PROBLEMY FIZIOLOGICHESKIKH IZMERENII V MEZHPLANETNYKH POLETAKH].
R. M. Baevskii.
Kosmicheskie Issledovaniia, vol. 3, Jul.–Aug. 1965, p. 636–642. 8 refs.
In Russian.

The information received during flights of the Soviet spacecrafts "Vostok" can be used in connection with aerospace medical problems of future exploration of space. Aerospace medicine includes medical supervision of the aircrew and physiological research under extraterrestrial conditions. A problem of importance is the transmission of data to the ground crew. The data can be transmitted to the ground where it can be processed and recorded or the processing can be done on board and the final data can be sent to the ground. Because of the use of energy with ground communication and great distances involved during interplanetary flight the use of on-board computers is recommended.

A65-82077
APPEARANCE OF DOMINANT LETHALS IN DROSOPHILA DURING EXPOSURE TO VIBRATION, ACCELERATION AND GAMMA-RADIATION [VOZNIKNOVENIE DOMINANTNYKH LETALEI U DROZOFILY POD VLIIANIEM VIBRATSII, USKORENIIA I GAMMA-OBLUCHENIIA].
G. P. Parfenov.
Kosmicheskiie Issledovaniia, vol. 3, Jul.–Aug. 1965, p. 643–651. 11 refs.
In Russian.

Vibration of various frequencies and durations did not cause any genetic or physiological damage to Drosophila melanogaster fully developed spermatozoa; however, it caused damage to the spermatid stage. Gamma irradiation before vibration increased the damage. Acceleration of males at 40 g for 20 min. did not affect egg fertilization. Acceleration of spermatids at 4,000 g for 20 min. produced no noticeable effect; however, it produced damage in the mature spermatazoa equivalent to 200–250 r of gamma radiation. The combined effect of irradiation and 4,000 g acceleration produced the effect equivalent to the sum of each separate exposure. But when the acceleration exposure was followed by the irradiation, the mutagenic effect was intensified.

A65-82078
EFFECT OF VIBRATION ON THE CELL MITOSIS IN BONE MARROW [VLIIANIE VIBRATSII NA DELENIE KLETOK KOSTNOGO MOZGA].
G. L. Pokrovskaia, L. A. Beliaeva, and A. V. Golovkina.
Kosmicheskie Issledovaniia, vol. 3, Jul.–Aug. 1965, p. 652–658. In Russian.

The effect of vibration of 35–70 c.p.s. frequencies on mitosis of bone-marrow cells was studied in mice. Vibration caused a depression of mitotic activity and disturbances in the cell-nucleus structure such as: fragmentation, bridges, bridges with fragmentation, and chromosome sticking. The cell division was not synchronized, which indicates that vibration affected the cells at rest and during division. It is possible that chromosomal disturbance takes place long after the exposure to vibration.

A65-82079
HEAD INJURIES AT CAPE KENNEDY.
Laurent P. Laroche (Pan Am. World Airways, Inc., Guided Missiles Range Div., Patrick AFB, Fla.)
American Journal of Nursing, vol. 65, Jun. 1965, p. 102–104.

Head injuries are not common at the missile launching area, but when they do occur, they demand much from the medical personnel, particularly the night nurses and the down-range medics, who may be as far away as 800 miles. Emergency measures are described, pertaining to the steps which must be taken in cases of head injury. A free airway must be obtained and continuously maintained in order to prevent an increase in the intracranial pressure. The conditions of the severely injured patient must be stabilized for transportation to the nearest hospital without additional harm; the head and body must be positioned, and the eyes of the unconscious patient must be protected from abrasion and drying by approximating the lids with tape. All preliminary simple clinical tests must be conducted before sending the patient to the hospital. The head-injury case must be given follow-up care after discharge from the hospital, and must be medically examined before returning to work.

A65-82080
HEAD INJURIES AT CAPE KENNEDY: NURSING OBSERVATIONS.
Ann McMechen (North Am. Aviation, Columbus, Ohio).
American Journal of Nursing, vol. 65, Jun. 1965, p. 104–105.

In answering an emergency call at Cape Kennedy for an employee who has a head injury, whether the injury is slight or severe, continuous nursing care is mandatory until the patient's condition is stable in every aspect. It is important to have the necessary equipment for immediate first-aid treatment and moving the patient. An open wound must be dressed with care to prevent further depression of any possible skull fracture. The patient must be examined for respiratory embarrassment and bleeding. The nurse must keep careful check on all physical signs until a doctor takes charge.

A65-82081
STUDIES ON SENSORY FEEDBACK: III. THE EFFECTS OF DISPLAY GAIN ON TRACKING PERFORMANCE.
Richard Allen Chase, John K. Cullen, Jr., Joseph W. Openshaw, and Scott Alexander Sullivan (Johns Hopkins U. School of Med., Neurocommun. Lab., Baltimore.; and Saint Elizabeth's Hosp., Clin. Neuropharmacol. Res. Center, Washington, D. C.)
Quarterly Journal of Experimental Psychology, vol. 17, Aug. 1965, p. 193–208. 55 refs.

Instrumentation is described which permits study of the effects of different forms of visual feedback display on the patterns of fine movement obtained from the extended human index finger when the subject is attempting to keep his finger at a fixed point in space. The task is a compensatory tracking task with the subject's finger movement as the only source of input. Increasing the gain of a proportional error signal resulted in marked improvement in the ability to maintain an extended finger at a fixed point in space. As the gain of the error signal was increased, the subject's high-amplitude, low frequency errors were reduced, and there was a progressive appearance of high frequency activity of low-amplitude, more accurately centered about the reference position in space. A total off-target area measure showed marked decrease in scores as the amplification of the error signal was increased from 1 through 10. There was no improvement beyond this gain. Other exploratory studies suggest that common mechanisms mediate the processing of the gain parameters of feedback displays, in some measure independent of the display form or the sensory modality used for presentation.

A65-82082
THE LIMITS OF OVER-CONSTANCY.
R. B. Joynson, L. John Newson, and D. S. May (Nottingham U., Dept. of Psychol., Great Britain).
Quarterly Journal of Experimental Psychology, vol. 17, Aug. 1965, p. 209–216. 15 refs.

A number of studies have led to the generalization that there is a tendency to "over-constancy" in the perception of size. The experiments reported here suggest that over-estimation is limited to objects subtending angles of approximately 2° or less, and that objects subtending greater angles are judged fairly accurately. This raises the possibility that foveal diameter (approximately 2°) is involved.

A65-82083
BINOCULAR RIVALRY AND THE CONTRAST AT CONTOURS
Paul Whittle (Cambridge U., Psychol. Lab., Cambridge, Great Britain).
Quarterly Journal of Experimental Psychology, vol. 17, Aug. 1965, p. 217-226. 11 refs.

Binocular rivalry was recorded between various achromatic figures in or near the foveae. For a pair of intersecting contours, one in the field of each eye, it was found that the percentage of time for which a contour was dominant at the point of intersection increased with the contrast at that contour, and also with average luminance when contrast was constant. Further, for 1^{o} circles in corresponding positions in the two fields, one darker than its surround and one lighter, the same results were obtained. Various auxiliary results on rate of rivalry, eye-dominance, the occasional mixture of the rivalling stimuli, and binocular lustre are given. Finally, the relationship between predominance in rivalry and perceived brightness is discussed.

A65-82084
THE NATURE OF THE AGE DECREMENT IN PERFORMANCE ON DICHOTIC LISTENING TASKS.
F. I. M. Craik (Liverpool U., Med. Res. Council's Unit for Res. on Occupational Aspects of Ageing, Liverpool, Great Britain).
Quarterly Journal of Experimental Psychology, vol. 17, Aug. 1965, p. 227-240. 10 refs.

When subjects of different ages are presented with a series of dichotic digits (as two simultaneous half-sets, one to each ear) there is an age decrement in the reproduction of the second half-set, possibly due to age decline in the efficiency of short-term memory. It seems equally possible, however, that the result is due to perceptual or attentional factors rather than memory factors. Two experiments were carried out in an attempt to specify the nature of the decrement. In the first, instructions as to which half-set to reproduce first were given before presentation of the digits. In the second experiment, attention was equally divided between the ears by giving these instructions after presentation. An analysis of types of errors in the first experiment suggests that attentional factors are more important, but from a similar analysis in the second experiment it is concluded that memory factors are largely responsible for the age decrement.

A65-82085
A NOTE ON THE APPLICATION OF INFORMATION THEORY TO STUDIES OF TRACKING BEHAVIOUR.
M. Hammerton (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, Great Britain).
Quarterly Journal of Experimental Psychology, vol. 17, Aug. 1965, p. 261-263. 10 refs.

Application of information theory to explain human tracking behavior is discussed, particularly with respect to Crossman's (1960) approach. Of the three conditions proposed by Crossman as necessary for a valid application of information theory to a tracking experiment, the author takes issue with the latter two conditions. Also, there is a dispute on some methodological deviations from a representative tracking experiment.

A65-82086
A REPLY TO DR. MAX HAMMERTON.
E. R. F. W. Crossman (Calif. U., Ind. Eng. Dept., Berkeley).
Quarterly Journal of Experimental Psychology, vol. 17, Aug. 1965, p. 264-266. 10 refs.

The author refutes Dr. Hammerton's theoretical criticisms on the conditions set forth for a valid application of information theory to tracking (Crossman, 1960). A more explicit explanation is given of the calculated input entropy and the necessity for similar bandwidths. Further, the methodological deviation in instructions from the usual tracking experiment is justified on the basis that it did not make much practical difference in the subject's performance but merely discouraged corner cutting.

A65-82087
RORSCHACH CORRELATES OF TIME ESTIMATION.
Ronald B. Kurz, Robert Cohen, and Susan Starzynski (Syracuse U., N. Y.).
Journal of Consulting Psychology, vol. 29, Aug. 1965, p. 379-382. 10 refs.

This study was designed to test the hypothesis that Rorschach scores which have been suggested as measures of the ability to delay gratification of needs are related to the manner in which the passage of time is perceived. Fifty-one men and women were given individual Rorschachs and then were asked to estimate the lengths of various time intervals. Correlations between the Rorschach scores and time estimations revealed that subjects with low % M and high Sum C overestimated the time intervals to a significantly greater extent than those with high % M and low Sum C. Time estimation scores were not related to % FM or % m. These findings appear to support the hypothesis that M is inversely related to the motivation for the rapid passage of time while C is positively related to the same motive.

A65-82088
FATTY ACID FLUX AND TRIGLYCERIDE SECRETION IN THE HYDRAZINE-INDUCED FATTY LIVER.
J. S. Amenta and A. M. Domingues (Armed Forces Inst. of Pathol., Washington, D. C.).
Experimental and Molecular Pathology, vol. 4, Jun. 1965, p. 282-302. 44 refs. U.S. Army Med. Res. and Develop. Command supported research.

Subcutaneous injections of hydrazine in rats caused accumulation of lipids in the liver. It is suggested that approximately half of the lipid accumulation was a result of the increased plasma nonesterified fatty acid flow into the liver cells. The increased triglyceride synthesis from this excess of nonesterified fatty acids, and a small decrease in the triglyceride secretion shortly after hydrazine injection was noted. Triglyceride transport into the liver did not appear to be a significant factor. Changes in the other metabolic pathways may account for the remaining 50% of the total triglyceride accumulation of the liver.

A65-82089
NEW DATA CONCERNING THE INFLUENCE OF ETHYL ALCOHOL ON HUMAN VISUAL THRESHOLDS.
G. Verriest and D. Laplasse (Ghent U., Dept. of Ophthalmol. and Dept. of Appl. Psychol., Belgium).
Experimental Eye Research, vol. 4, Jun. 1965, p. 95-101. 13 refs.

Sixteen abstinent and 24 moderately drinking male subjects have been submitted twice to an elaborate and standardized test run, involving measurements of threshold luminance during the course of dark adaptation, during glare in the dark adapted state, and after glare in the dark adapted state as well as measurements of threshold luminance for ten visual acuities belonging to the scotopic and mesopic ranges, and measurements of the pupillary diameter under photopic conditions. In every subject of each group one test run was done under control conditions, and the other after an alcohol ingestion giving rise to a blood alcohol concentration of about 0.065%. The great majority of the paired mean results obtained in this way do not differ significantly, so that our experience contradicts other authors' statements claiming an obvious visual disturbance from blood alcohol concentrations as low as 0.045%. However, the few significant differences we obtained suggest that the resistance to glare is slightly diminished in a very late stage and that abstinent subjects might be more prone to sustain their performance by an increase of vigilance.

A65-82090
SERUM MUCOPROTEIN LEVELS AFTER STRESS IN YOUNG AND OLD RATS.
Z. Hruza, V. Hlavackova, and J. Neuwirt (Czechoslovak Acad. of Sci., Inst. of Physiol.; and Charles U., Inst. for Exptl. Pathol., Prague).
Experimental Gerontology, vol. 1, Jul. 1965, p. 133-138. 13 refs.

Following Noble-collip drum (NCD) trauma or hydrocortisone administration the level of serum mucoproteins rises. This rise is greater in young than in old rats, and the same holds for the application of hydrocortisone. Application of radioactive sulphate to rats before and after stress showed that radioactivity in serum mucoproteins rose only in the time radioactive sulphate can be used directly for new serum mucoprotein formation. Sulphate incorporated into the tissues was not found in serum mucoproteins after stress. It is concluded that greater formation of serum mucoproteins in the liver, de nova, is responsible for serum mucoprotein rise after trauma in the Noble-collip drum. Smaller reaction in old rats must be caused by smaller protein synthesis.

A65-82091
LOW AMBIENT PRESSURE ENVIRONMENTS AND TOXICITY; A NEW APPROACH TO SPACE CABIN TOXICOLOGY.
Anthony A. Thomas 96570 Aerospace Med. Res. Labs., Toxic Hazards Branch, Wright-Patterson AFB, Ohio).
(Am. Acad. of Occupational Med., 17th Ann. Meeting, Columbus, Ohio, Feb. 17-19, 1965).
Archives of Environmental Health, vol. 11, Sep. 1965, p. 316-322
AF Systems Command supported research.

A unique inhalation exposure facility has been built at the 6570 Aerospace Medical Research Laboratories to study the effect of low atmospheric pressure and oxygen-rich atmospheres on the characteristics of truly uninterrupted long-term exposure to toxic gases and vapors encountered in the atmospheres of space cabins. The experiments were conducted on various experimental animals. The completed series of experiments showed that 90-day 5 p.s.i.a. oxygen exposure elevated serum glutamic-pyruvate transaminase in both monkeys and dogs. Only serum glutamic pyruvate and glutamic oxalacetic transaminases, and alkaline phosphatase were elevated in cases of carbon tetrachloride exposure, and only in very high concentration. Even this concentration failed to kill either dogs or monkeys. Neither nitrogen dioxide nor ozone produced any clinical changes even in high concentration, although some animals died. Future plans include the toxicological qualification and screening of Apollo space cabin materials for boil-off and outgassing.

A65-82092
INTRAVASCULAR PRESSURE MEASUREMENTS DURING VIBRATION.
J. H. Dines, J. H. Sutphen, L. B. Roberts, and W. F. Ashe.
(Am. Acad. of Occupational Med., 17th Ann. Meeting, Columbus, Ohio, Feb. 17–19, 1965).
Archives of Environmental Health, vol. 11, Sep. 1965, p. 323–326.
Grant NIH OH–00006–05.

The author describes the catheter tip blood pressure transducer for measuring intravascular pressure during exposure of a subject to vibration. Used in dogs and inserted through the right femural artery into the descending aorta, it registered blood pressure simultaneously with electrocardiogram tracings and table movement. It produced accurate pressure curves during vibration and demonstrated the narrow boundary between physical and physiological response. Part of the curves showed transient changes in heart rate and blood pressure, for which no explanation could be given on the evidence presented. The increased heart rate seemed to be a constant factor. This increase was noted even when the blood pressure did not show the characteristic dip, and seemed to indicate that the change in heart rate is independent of the changes in blood pressure, and that vibration may affect directly the cardiac center. Because the effect was similar to that observed after injection of epinephrine, it is possible that vibration causes the release of this substance.

A65-82093
ON NOISE AND VIBRATION EXPOSURE CRITERIA.
Henning E. von Gierke (Aerospace Med. Res. Labs., Biodyn. and Bionics Div., Wright-Patterson AFB, Ohio).
(Am. Acad. of Occupational Med., 17th Ann. Meeting, Columbus, Ohio, Feb. 17–19, 1965).
Archives of Environmental Health, vol. 11, Sep. 1965, p. 327–339. 44 refs.
AF Systems Command supported research.

No generally accepted criteria for rating vibration exposure are available. All proposed rating schemes are based on subjective judgment of tolerability or comfort and not on objective indications of various levels of risk of physiological damage. In view of the strong general desire to agree on a uniform criteria for general use are being developed; however, there is no choice but to base them on a compromise between the various subjective rating schemes proposed. Inclusion of the time dependence of the acceptability of vibration levels in line with some of the data discussed appears very desirable. Quantitative criteria for hand tool vibrations cannot yet be stated. The national and international working groups concerned with the development of these criteria strongly urge the support of anyone interested in this topic and the submission of any relevant data for consideration.

A65-82094
TRICHLOROETHYLENE INTOXICATION: A CASE OF ACUTE HEPATIC NECROSIS POSSIBLY DUE TO THIS AGENT.
Robert J. Priest and Robert C. Horn, Jr. (Henry Ford Hosp., Detroit, Mich.)
Archives of Environmental Health, vol. 11, Sep. 1965, p. 361–365. 6 refs.

The patient had no known exposure to carbon tetrachloride, but to trichloroethylene, which is believed to be toxic to the liver only in concentrations that would produce symptoms related to its anesthetic properties, symptoms this patient was not known to have had. Nevertheless, it is probable that trichloroethylene was the etiologic agent of this man's fatal hepatic necrosis. There was uncertainty about the patient's conditions of exposure, as well as the exact chemical composition of the degreasing agent used. Knowledge of these facts might permit a more positive conclusion. It is stated that the trichlorethylene was hot, but it was not known to what temperature it was heated; nor was there any knowledge available of the ventilatory conditions in the shop where the degreasing operations were carried out. Finally, it is entirely possible that, in addition to trichloroethylene, the degreasing agent contained various impurities of trichloroethylene, breakdown products of it, or both.

A65-82095
NEW TECHNIQUE FOR MASS ASSAYS OF PHYSIOLOGICAL CHARACTERISTICS OF UNICELLULAR ALGAE.
Richard L. Massey and Rudolf H. T. Mattoni (North Am. Aviation, Inc., Space and Inform. Systems Div., Downey, Calif.)
Applied Microbiology, vol. 13, Sep. 1965, p. 798–800.
Contract AF 41(609)-2368.

An apparatus is described and illustrated which enables an investigator to inoculate simultaneously a large number of unicellular algal suspensions onto an agar surface. These inoculations may be repeated an infinite number of times with a very small amount of inoculum. Good results have been obtained from tests in which large numbers of algae were placed on selective media containing various amounts of many antibiotics, growth factors, and sugars.

A65-82096
SELECTION OF TEST ORGANISMS FOR USE IN EVALUATING MICROBIAL INHIBITORS IN FUEL-WATER SYSTEMS.
Paul Edmonds (Dayton U., Dept. of Biol., Ohio).
Applied Microbiology, vol. 13, Sep. 1965, p. 823–824.
Contract AF 33(657)-9175.

Microorganisms present in jet-fuel storage tanks may affect the filter systems of an aircraft by forming sludge deposits. Forty-three cultures of microorganisms isolated from a variety of fuel samples were tested for growth in a mineral salt medium with a JP-4 jet fuel as a sole carbon source. Three cultures of bacteria (Pseudomonas) and two cultures of fungi (Hormodendrum) and Cladosporium) were found to utilize fuel as the sole carbon source. The remaining isolates did not exhibit growth in this system, but survived and grew when subcultured in standard laboratory media. A significant difference in growth response of a fuel-utilizing organism and a fuel isolate which did not grow was obtained from growth measurements in the aqueous phase of the test system by dry weights of the mycelial mat. The fuel-utilizing microorganisms have been subcultured at monthly intervals on a mineral salts-fuel medium and maintained for longer than one year.

A65-82097
A CHRONOLOGY OF TWO WEEKS' FALLOUT SHELTER CONFINEMENT.
John A. Hammes, Thomas R. Ahearn, and James F. Keith, Jr. (Ga. U., Athens).
Journal of Clinical Psychology, vol. 21, Oct. 1965, p. 452–456. 5 refs.
Contract OCD-OS-62-226.

Thirty shelterees, 15 males, 15 females, aged 7–66 years, participated in the following two week test. Stress conditions included 8 sq. ft./person of living space, and rations consisting of 1 qt./person/day of water and 900 cal./person/day of survival biscuits. There were no bunks, no blankets, no water for bathing, no coffee, and only one pack of cigarettes per smoker. Shelterees had no time pieces, and daylight clues were excluded from the enclosed shelter area. The chronology does not yield any evidence that indicates deleterious psychological or physiological effects as a result of the confinement test. Further studies are in progress on shelter management staff training, in-shelter activity programs, and post-attack preparation.

A65-82098
SERUM ACTIVITY CHANGES AS EVIDENCE OF LIVER REACTION TO ORAL ALCOHOL.
D. M. Goldberg and C. Watts (Glasgow U., Western Infirmary, Dept. of Pathol. Biochem. and Dept. of Biochem., Scotland).
Gastroenterology, vol. 49, Sep. 1965, p. 256–261. 24 refs.

Oral alcohol, administered in a dose of 1.7 g. per kg. of body wt. to eight healthy subjects resulted in significant elevation of serum isocitric dehydrogenase at 4 hr., and of serum ornithine carbamyl transferase at 15 hr. after ingestion. There were no significant alterations in the mean activities of serum glutamicoxaloacetic transaminase nor of bromosulfophthalein retention during the period studied. It is suggested that the enzymes found to be elevated in the serum are released from liver cells, although other possibilities are discussed.

A65-82099
ALTERATIONS IN PULMONARY DIFFUSING CAPACITY AND PULMONARY CAPILLARY BLOOD VOLUME WITH NEGATIVE PRESSURE BREATHING.
Sheldon H. Steiner (Veterans Admin. Hosp., Med. Serv., Indianapolis, Ind.), Regina Frayser, and Joseph C. Ross (Ind. U. Med. Center, Dept. of Med. and Heart Res. Center, Indianapolis).
Journal of Clinical Investigation, vol. 44, Oct. 1965, p. 1623–1630. 39 refs.
Contract AF 33(616)8378; and Grants Natl. Heart Inst. HE-6308, HE-7398, and HE-6228.

Studies on trained normal young adult males showed that negative pressure breathing increases pulmonary capillary blood volume (Vc) and breath-holding diffusing capacity for carbon monoxide (D_L) to a degree comparable to that occurring with moderate exercise. Oxygen consumption is not similarly increased, indicating that the increase is not related to the metabolic effects of the muscular activity. The findings indicate that the increase in D_L with negative pressure breathing is attributable to an increase in the size of the effectively ventilated pulmonary capillary bed. The increase in Vc during negative pressure breathing must be due, at least in part, to better distribution of perfusion, but is seems certain that previously open capillaries are also being distended, probably as a mechanical consequence of the applied negative pressure. This does not exclude the possibility that alterations in ventilation account for the previously described decrease in arterial oxygen saturation during negative pressure breathing.

A65-82100
ALTERATIONS OF SURFACTANT IN OXYGEN POISONING.
Clarence R. Collier, Jack D. Hackney, and Donald E. Rounds (Rancho Los Amigos Hosp., Downey; Loma Linda U., Los Angeles; and Pasadena Found. for Med. Res., Calif.)
Diseases of the Chest, vol. 48, Sep. 1965, p. 233–238. 18 refs. Calif. Tuberc. and Health Assoc. supported research.
Grant PHS OH 00/55.

Experimental studies on rabbits suggest the importance of surfactant in the pathogenesis of the lung damage due to O_2 poisoning. Several possibilities exist for its role in the pathogenesis of lung damage. These findings raise several important clinical questions which can only be answered after further experimental work.

A65-82101
POSITIONAL EFFECTS OF GASTRIC DISTENTION UPON THE MEAN ELECTRICAL AXIS OF THE QRS COMPLEX OF THE ELECTROCARDIOGRAM.
Martin Duke (Manchester Mem. Hosp., Depts. of Med. and Cardiol., Conn.)
Vascular Diseases, vol. 2, Jul. 1965, p. 161–167. 9 refs.
Gertrude H. Rogers Fund supported research.

The presence of increased amounts of air within the stomachs of patients in the supine position only infrequently produced small changes in the mean electrical axis of the QRS complex of the electrocardiogram. The same degree of gastric distention, however, in those in the upright position caused a leftward shift of the meanQRS axis in all subjects except those with the greatest tendency to left axis deviation in the control upright position. A return to the supine position or deep inspiration reversed this leftward shift.

A65-82102
OFFICE EXERCISE ELECTROCARDIOGRAPHY.
M. E. Lynch, A. M. Koff, and C. E. McLean. (Hartford Hosp., Cardio-Resprat. Lab.; and Veterans Admin. Hosp., Outpatient Serv., Newington, Conn.)
Vascular Diseases, vol. 2, Jul. 1965, p. 208–213. 13 refs.

A technique for recording the head-chest-lead electrocardiogram during treadmill and stair-climbing exercise using liquid junction type electrodes is described. The left arm electrode is applied to the V_5 position, the right arm electrode to the right forehead, and the right leg electrode to the right chest as a ground. Although limited to a single lead, the ability to monitor the electrocardiogram during exercise gives the physician not only an additional safeguard during tests for coronary insufficiency but also a means of more accurately assessing functional classification "stair-climbing" type tests of cardiac function.

A65-82103
MICE AT -3° C.
S. A. Barnett (Glasgow U., Zool. Dept., Scotland).
New Scientist, vol. 27, Sep. 16, 1965, p. 678–679.

The discovery that house mice could live in refrigerated stores has provoked extensive research into how they adapt to a cold environment. Laboratory mice were bred for tens of generations in rooms kept at -3° C. The adaptation to cold which occurred in the mice over the number of generations is not easily explained. The relative importance of insulation by more hair and (or) nesting material is discussed, and the increased food consumption with economy in materials or energy is examined. The adaptation to a cold environment suggests a genetical change, but there is evidence for some sort of cumulative maternal effect. The principal fact is that inbred mice have become better adapted to a cold environment as a result of breeding there for a number of generations. This observation suggests that the cold-adaptation of mammals has features which cannot be fully revealed by short-term experiments.

A65-82104
SOME STUDIES OF PATTERN PERCEPTION USING A STABILIZED RETINAL IMAGE.
C. R. Evans (Reading U., J. J. Thomson Phys. Lab., Great Britain).
British Journal of Psychology, vol. 56, Aug. 1965, p. 121–133. 11 refs.
Grant PHS NB-01233.

Using a stabilization device capable of covering 30° of the visual field, targets of various shapes were studied extensively. Very large and consistent differences were found between the percentage disappearances of most targets and this was found not to be a function of length of line or boundary. The presence of corners and intersections in a target increased percentage disappearance. Jagged, angular figures disappeared more than rounded, topologically similar ones. When acute angles were present, the disappearance rate was radically raised. About 10% of the time when a target disappeared, it disappeared as a complete unit, though this figure varied somewhat from target to target and was very high in the case of the circle. A mean of about 15% of all disappearances were 'patterned' or 'structured', and these proportions held true for all subjects tested.

A65-82105
THE PERCEPTION OF ILLUSIONS AS A CONSTANCY PHENOMENON.
L. B. Brown and L. Houssiadas (Adelaide U., Australia).
British Journal of Psychology, vol. 56, Aug. 1965, p. 135–141. 14 refs.

The view, recently revived, that the non-veridical perception of visual illusions results from size constancy processes set up by the depth features of flat figures has been tested with a series of eight stimuli. Data collected from experiments with 44 subjects suggest that this view applies only to a limited range of visual illusions and that, therefore, it has not the generality claimed by its proponents.

A65-82106
MATCHING LOUDNESS AND VOCAL LEVEL: AN EXPERIMENT REQUIRING NO APPARATUS.
R. J. Irwin (Auckland U., New Zealand) and A. William Mills (Tufts U., Medford, Mass.)
British Journal of Psychology, vol. 56, Aug. 1965, p. 143–146. 5 refs.

Both the loudness of a sound and the apparent magnitude of a self-produced vocal response (autophonic response) can be described as power functions of sound pressure, although with different exponents. Two scales, one of loudness, the other of autophonic level, can therefore be specified as a function of the same sound pressures. Under these circumstances theory predicts that loudness should be proportional to the square root of apparent autophonic level. Two separate but similar classroom experiments were performed, in each of which one person made autophonic responses of six different magnitudes whose loudnesses were judged by the members of the class. The obtained exponents between the two scales so erected were 0.52 in one demonstration and 0.53 in the other, thus confirming the prediction. The experiments used no apparatus since the only specification of the stimulus required was that the sound pressure produced by one subject should be the same as that judged by another.

A65-82107
REMINISCENCE, INHIBITION AND CONSOLIDATION.
S. Rachman and J. Grassi (London U., Inst. of Psychiat. (Maudsley Hosp.), Great Britain).
British Journal of Psychology, vol. 56, Aug. 1965, p. 157–162. 13 refs.

The inability of the two-factor theory of inhibition to account for some of the experimental findings on psychomotor learning has led Eysenck (1964) to formulate a new theory which introduces the concept of consolidation. The present experiment describes an attempt to separate the inhibitory factors and the consolidation process. Fifty-five subjects were randomly assigned to one of four groups and made to practice on the pursuit rotor for five minutes without a rest. They were then re-tested four hours later and reminiscence scores were obtained. The results indicate that if an interfering task is given immediately after the initial practice period is completed, then the process of consolidating the motor learning is adversely affected.

A65-82108
A THREE-FACTOR THEORY OF REMINISCENCE.
J. J. Eysenck (London U., Inst. of Psychiat., Great Britain).
British Journal of Psychology, vol. 56, Aug. 1965, p. 163–182. 88 refs.
D. S. I. R. supported research.

A three factor theory of reminiscence is suggested, making use of the concepts of consolidation, reactive inhibition, and conditioned inhibition. It is further suggested that the reminiscence phenomenon is highly task-specific, in the sense that different tasks call differentially for the various processes hypothesized. Furthermore, it is suggested that differences in drive conditions, personality, fatigue, drug administration and many other variables impose definite limits to the replication of research findings, and that only specific studies of the influence of these variables, within a given theoretical context, can lead to a proper quantitative theory of reminiscence.

A65-82109
EFFECTS OF AGE ON SHORT-TERM STORAGE AND SERIAL ROTE LEARNING.
James Inglis and Mary N. Ankus (Queen's U., Kingston, Ontario, Canada).
(Am. Psychol. Assoc., Ann. Meeting, Los Angeles, Sep. 1964).
British Journal of Psychology, vol. 56, Aug. 1965, p. 183–195. 28 refs.
Grant Ontario Mental Health Found. 25.

Previous studies have shown that, as age advances, there is a progressive decrease in the ability to respond sequentially to simultaneous stimuli. It has been suggested that this impairment with age is due to a decline in the efficiency of some short-term storage process. This paper describes the results obtained from 120 normal subjects aged from 11 to 70 years in their reproduction of dichotic digits (a) when the order of recall is left to the free choice of the subject, (b) when the order of recall has been specified before, and (c) after these digits have been delivered. The correlation of performance on this task with performance on serial learning is also described. The results obtained confirm the view that it is a change in some short-term

storage process rather than in any perceptual function which principally affects performance in this kind of experimental situation. Evidence was also obtained that short-term storage is an important, but not a unique component, of longer term learning.

A65-82110
MEMORY AND THOUGHT IN HUMAN INTELLECTUAL PERFORMANCE.
Michael I. Posner (Wis. U., Dept. of Psychol., Madison).
British Journal of Psychology, vol. 56, Aug. 1965, p. 197–215. 44 refs.
DOD and Wis., U. supported research.
Contract AF 49(638)-1235.

This paper is a review of efforts to extend the use of information techniques to tasks which are intellectual in nature. Complex tasks such as problem solving and concept formation are viewed in terms of simpler processes of information transformations and immediate memory. The first section of the paper considers efforts to describe the difficulty of transformation such as occur in arithmetic operations and concept utilization in terms of their informational parameters. The second part considers the relationship of these transformations to tasks which require retention. The final section extends the analysis to the complex sequential tasks of induction, problem solving and reading. The paper as a whole may be considered as a quantitative extension of the view of thinking as skilled performance.

A65-82111
PROBABILITY LEARNING IN STEP-INPUT TRACKING.
C. B. Gibbs (Defence Res. Med. Labs., Toronto, Canada).
British Journal of Psychology, vol. 56, Aug. 1965, p. 233–242. 19 refs.

Six men and six women tracked stimuli that demanded responses of unequal probability. The control display relation was directionally incompatible. Half of the subjects used their non-preferred hand. Many large directional errors occurred in early practice and these were amended after a mean delay of 0.24 sec. With continued practice, small errors persisted mainly in responses of low probability but the mean amendment time fell to 0.11 sec. These errors provided new, highly sensitive measures that revealed differences in performance associated with sex, hand preference and probability ($P < 0.01$). The results are compatible with hypotheses that the speed, direction and extent of movement are determined by negative proprioceptive feedback and integral-error control (Gibbs, 1954).

A65-82112
ANALYSIS OF VISUAL AND PROPRIOCEPTIVE COMPONENTS OF MOTOR SKILL BY MEANS OF A DRUG.
D. Legge (London U. Coll., Great Britain).
British Journal of Psychology, vol. 56, Aug. 1965, p. 243–254. 35 refs.
Grant Natl. Inst. of Mental Health MH-03313.

Skilled manual responses depend upon information about the position of the hand which is to be moved. In order to throw light on the way in which CNS depressant drugs impair skill, an experiment was performed to study the effect of nitrous oxide on the perception of hand position by vision and by proprioception. The results show that these two modalities were less efficient in combination than was either separately. The drug increased the variability of performance irrespective of the perceptual conditions. The drug also produced systematic changes in constant error, by its action either on vision or on proprioception. Drug induced increases in the size of handwriting may be explained as changes which compensate for the effects of the drug on perception.

A65-82113
EXPERIMENTAL ANALYSIS OF DRUG EFFECTS ON HUMAN PERFORMANCE USING INFORMATION THEORY CONCEPTS.
Colin Berry, Michael G. Gelder, and Arthus Summerfield (London U. Coll. and Birkbeck Coll., Great Britain).
British Journal of Psychology, vol. 56, Aug. 1965, p. 255–265. 21 refs.
Grant Natl. Inst. of Mental Health MH-03313.

Effects of differences in mean stimulus information under two coding conditions and of an esthetic doses of nitrous oxide (15, 25 and 35% in oxygen) were investigated in two card-sorting experiments with student subjects. In Expt. I, in which conventional playing cards were sorted into two, four or eight classes, the effect of the drug increased significantly with task complexity. Expt. II, in which cards bearing numerals were used, showed a drug effect which was independent of task complexity measured by mean information per stimulus. Neither result was to be explained in terms of a drug effect on the motor component of the tasks. Reasons for the difference between the two experiments are considered in relation to other evidence of effects of central nervous depressant drugs on input processes and short-term memory. The value of communication models for research on effects of drugs on human skills is discussed.

A65-82114
PERSONALITY AND THE INVERTED-U RELATION.
D. W. J. Corcoran (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, Great Britain).
British Journal of Psychology, vol. 56, Aug. 1965, p. 267–273. 16 refs.

Difficulties with the postulated inverted-U relationship between performance and arousal are discussed, with emphasis upon individual differences in level of arousal. Predictions concerning the behaviour of highly aroused and less aroused subjects are made and tested in two experiments by relating changes in performance associated with increased and decreased levels of arousal to introversion score. Introverts behave as highly aroused subjects were expected to and extraverts are less aroused subjects.

A65-82115
RENAL HEMODYNAMICS: THE EFFECT OF GRAVITY ON SODIUM AND WATER EXCRETION.
William M. Stahl. (Vt. U. Coll. of Med., Dept. of Surg., Burlington).
Aerospace Medicine, vol. 36, Oct. 1965, p. 917–922. 42 refs.
Grant PHS HE-07785.

Studies of sodium and water excretion in addition to hemodynamic parameters were made in two series of anesthetized dogs. All dogs were sodium and water loaded and the second series received, in addition, supramaximal levels of 9-alpha-fluorohydrocortisone and vasopressin. In both series urine volume and sodium excretion decreased from supine control levels, with the assumption of the vertical head-up position, and returned to control levels or above in the vertical head-up position immersed in water. Changes in cardiac output, renal vascular resistance and renal tissue pressure were related to change in gravity state. The implications of these alterations in renal regulation of sodium and water are discussed.

A65-82116
THE EFFECTS OF MINIMAL DEHYDRATION UPON HUMAN TOLERANCE TO POSITIVE ACCELERATION.
Ellen H. Taliaferro, R. R. Wempen, and W. J. White (Douglas Aircraft Co., Inc., Advan. Biotechnol. Dept., Santa Monica, Calif.)
Aerospace Medicine, vol. 36, Oct. 1965, p. 922–926. 7 refs.

The responses of three groups of human subjects to positive acceleration after undergoing minimal dehydration and heat stress are presented. A decrease in acceleration tolerance of 15 per cent to 18 per cent was noted. It was determined that the effects of heat stress alone did not produce the observed decrease. The possible underlying mechanisms producing these effects are discussed and recommendations are made for future studies.

A65-82117
COMPARATIVE PHYSICAL PERFORMANCES OF NAVAL AVIATOR TRAINEES FROM VARIOUS PROCUREMENT SOURCES.
James R. Berkshire (U. S. Naval School of Aviation Med., Pensacola, Fla.)
(Aerospace Med. Assoc. Meeting, New York City, Apr. 28, 1965).
Aerospace Medicine, vol. 36, Oct. 1965, p. 927–928.

The Physical Training Department of the U. S. Naval School, Pre-Flight, administers a battery of physical ability tests at the beginning and at the end of pre-flight school training. The scores from two of these tests were analyzed for separate samples of students from 1963 and 1964. There were fairly consistent differences in the physical abilities of men coming from different procurement sources and these differences persisted despite training. Also, a two week shorter training syllabus, which concentrated on conditioning exercises to the exclusion of physical skills training (such as gymnastics and trampoline) resulted in as much or more improvement in test performance than did the longer mixed syllabus of 1963.

A65-82118
MEASURE OF SUSCEPTIBILITY TO PSYCHOLOGICAL STRESS.
Partick M. Curran and Robert J. Wherry, Jr. (U. S. Naval School of Aviation Med., Pennsacola, Fla.)
(Aerospace Med. Assoc. Meeting, New York City, Apr. 26, 1965).
Aerospace Medicine, vol. 36, Oct. 1965, p. 929–933.

Wherry's model of psychological stress postulates a number of determiners of anticipatory physical threat stress (APTS), emphasizing the necessity for being able to actively control subjects' perceptions of threatening events. Environmental cues were manipulated attempting to control subjects' perceptions of such determiners of APTS as the perceived probability of unpleasant events (P'), the perceived proximity of unpleasant events (X'), and the perceived degree of unpleasantness of possible events (U'). A four-choice, color discrimination task was employed. Instructions for experimental and control subjects structured the situation as involving information processing in a standard aircraft mission emergency. The threatening event was the possible occurrence of electrical shock. The findings were that systematic changes in environmental cues resulted in significant performance changes for the subjects. The hypothesized effects of P', X', and U' were substantiated. Wherry's model for anticipatory physical threat stress was confirmed.

A65-82119
ELECTRONYSTAGMOGRAPHY IN THE CAT—THE CALORIC TEST.
Bosko Milojevic and R. J. Voots (Iowa U. Coll. of Med., Dept. of Otolaryngol. and Maxillofacial Surg., Iowa City).
Aerospace Medicine, vol. 36, Oct. 1965, p. 933–939. 18 refs.
Grant PHS NB-02779.

The experiment was performed on 62 cats over a period of one year. Five hundred and thirty-six caloric tests were done and nystagmus was recorded by electronystagmography. Three types of electrodes were used: perizygomatic chronic silver wire, unipolar chronic zygomatic, and acute subdermal needle. Three parameters (slow phase velocity, fast phase velocity, and duration of post caloric nystagmus) were measured, following different caloric stimuli. The influence on results of three common diseases of the cat—enteritis, pneumonitis and otitis media—are discussed. Condition of the external meatus, conditioning period of the animal, and influence of fixation or blindfoldedness on caloric nystagmus are analyzed. Irregularities of postcaloric nystagmus in the cat are discussed and attributed to central and peripheral inhibitory mechanisms.

A65-82120
HUMAN TOLERANCE LIMITS IN WATER IMPACT.
Richard G. Snyder (FAA, Civil Aeromed. Res. Inst., Oklahoma City, Okla.)
(Space and Flight Equipment Assoc. Symp., San Diego, 1964).
Aerospace Medicine, vol. 36, Oct. 1965, p. 940–947. 25 refs.

This study attempted to identify and evaluate factors critical to protection and survival in human water impact. Theoretical mathematical bases for impact loadings on the body were noted, along with discussion of stunt jumper techniques. Fifty (39 males, 11 females) cases of free-falls survived by individuals aged 7 to 80 years impacting water environments at over 55 ft./sec. during the past three years were intensively investigated and analyzed. These represented over 25 per cent of the 281 known water free-falls survived during this period. In addition, autopsy data in fatal falls occurring under similar environmental conditions during this time were compared. Fatal cases sometimes presented a problem as to whether death was caused by drowning, and if so, whether the impact trauma could have been survivable. The most survivable body orientation, by a factor of 5-7 times, was a ($^{+}G_z$) feet-first deceleration, in which critical velocity for human survival was slightly over 100 ft./sec. (116 ft./sec. max). In fatal cases a high proportion of rib fractures in lateral and transverse impact orientations caused fatal penetration of the lungs and other internal organs. Patterns of injury and relationships of factors found to influence human survival tolerances are presented and compared with impact trauma on non-water surfaces.

A65-82121
INFLUENCE OF ALVEOLAR NITROGEN CONCENTRATION AND ENVIRONMENTAL PRESSURE UPON THE RATE OF GAS ABSORPTION FROM NON-VENTILATED LUNG.
J. Ernsting (RAF Inst. of Aviation Med., Fairborough, Hants, Great Britain).
Aerospace Medicine, vol. 36, Oct. 1965, p. 948–955. 18 refs.

The influence of the concentration of nitrogen (between 0 and 79 per cent) in the previously respired gas and of environmental pressure (between 280 and 760 mm. Hg) upon the rate of absorption of gas from non-ventilated lung was studied in a dog. In the initial faster phase of gas absorption the rate was independent of the nitrogen concentration but increased with reduction of environmental pressure. During the final slower phase the rate of absorption decreased as the inspired nitrogen concentration was raised and as the environmental pressure was reduced. The mechanisms involved in the development of acceleration atelectasis are discussed in relation to these experimental findings. It is concluded that the effectiveness of a given inspired concentration of nitrogen in retarding the development of acceleration atelectasis should increase as the environmental pressure is reduced.

A65-82122
SELF-REPORTED STRESS-RELATED SYMPTOMS AMONG AIR TRAFFIC CONTROL SPECIALISTS (ATCS) AND NON-ATCS PERSONNEL.
John D. Dougherty, David K. Trites, and J. Robert Dille (FAA, Fort Worth, Tex. and Office of Aviation Med., Oklahoma City, Okla.)
Aerospace Medicine, vol. 36, Oct. 1965, p. 956–960.

The impact of air traffic control work on the health of Air Traffic Control Specialists (ATCS) has been of concern to the Federal Aviation Agency (FAA) for some years. Those who are engaged in the occupation, as well as external observers, have expressed the belief that the stress inherent in the occupation has an adverse effect on ATCS. Unfortunately, there is little objective evidence on which an evaluation of this belief can be based. The present investigation represents an attempt to evaluate the impact of the ATCS work on the health of those engaged in it. As part of an employee health program conducted in the southwestern states by the senior author, information about specific health problems was solicited on an anonymous basis from participants in the program. The data collected permitted comparison of ATCS personnel with personnel not engaged in ATCS work. It was felt that if the ATCS occupation was indeed stressful, then the comparisons of health information from the two groups should indicate a higher incidence of health problems among the ATCS.

A65-82123
UPPER THERMAL TOLERANCE LIMITS FOR UNIMPAIRED MENTAL PERFORMANCE.
John F. Wing
Aerospace Medicine, vol. 36, Oct. 1965, p. 960–964. 16 refs. AF Systems Command supported research.

Fourteen experiments done in various laboratories assessed the effects of high thermal stress on mental performance. These experiments represent different combinations of exposure time and effective temperature. When the results of these studies are reviewed, they indicate that the upper thermal limit for unimpaired mental performance varies systematically with exposure duration. Specifically, the lowest test temperatures yielding statistically reliable decrements in mental performance decline exponentially as exposure durations are increased up to four hours. When this temperature-duration curve for mental performance is compared with physiological tolerance curves, it is found to lie well below them at every point in time.

A65-82124
EFFICACY OF PRESSURE SUIT COOLING SYSTEMS IN HOT ENVIRONMENTS.
James H. Veghte (Aerospace Med. Div., Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 36, Oct. 1965, p. 964–967. 8 refs.

Three different air distributing systems and one water-cooled system were evaluated for efficacy in cooling a person in a full pressure suit. Five subjects participated in experiments at atmospheric pressure in a 43o C. environment. The pressure suit was worn unpressurized and pressurized at 192 mm. Hg. The results show the separate tubular air ventilating garment to be equal to or superior in evaporative cooling efficiency to either an extremity distributing system which is an integral part of the current operational full pressure suit, or to the standard Air Force ventilating garment. The water-cooled system was superior to all air distribution systems and the subjects were comfortable for the entire two-hour test period. In control experiments with no ventilation, tolerance limits were reached before the end of two hours. On the basis of these data, serious consideration of water-cooled suit systems for maintaining a person in thermal comfort under conditions of thermal stress should be continued.

A65-82125
COMPRESSION FRACTURES OF THE SPINE DURING USAF EJECTIONS.
Richard M. Chubb, William R. Detrick, and Robert H. Shannon (Deputy Inspector Gen., Med. Serv., Life Sci. Div., Norton AFB, Calif.)
Aerospace Medicine, vol. 36, Oct. 1965, p. 968–972.

A study was made of 928 USAF ejections in 1960 through 1964 to determine the most probable cause of compression fractures of the spine during ejection. Excluding multiple extreme injuries, missing persons, and downward and rotational ejections, only 729 ejections were included in the study. Factors considered were age, height, and weight of the individual; body position at the time of ejection; the type of aircraft and ejection seat catapult; tower training with a live ballistic seat; cushioning agents; and parachute landing terrain. Of the 44 individuals with compression fractures, 28 were believed to have received them during ejection and 16 during parachute landing. Sitting in the erect position with hips and head firmly against the seat was the most significant factor in prevention of compression fractures. Increasing age, lack of tower training, use of M-3 or rocket catapults, and ejection from bombers were interrelated factors possibly contributing to fractures.

A65-82126
REPEATED, PROLONGED, LOW-INTENSITY $+G_z$ EXPOSURES. ANATOMICAL STUDIES IN DOGS.
R. H. Murray, J. Prine, and R. P. Menninger (Ind. U. Cardiopulmonary Lab. and Aerospace Med. Res. Labs., Toxicol. Branch).
Aerospace Medicine, vol. 36, Oct. 1965, p. 972–976. 21 refs.
Contract AF 33(616)-8378.

To determine the tolerance and the pathological effects of repeated, prolonged, low-intensity $+g_z$ exposure, 6 dogs were anesthetized and exposed for one-hour periods to $+2.2g_z$ (positive g) twice weekly for fifteen weeks. Four of the six dogs died, all during the centrifugation. Autopsy revealed only moderate lung and visceral congestion and no anatomical lesions to which death could be attributed. Previous, similar studies in rats and dogs demonstrated significant renal lesions without mortality. It is suggested that these differences in results were due to variations in experimental technique. The restrictive experimental conditions forbid direct application to these data to human exposures.

A65-82136
AUDIOMETRIC ASPECTS AND MULTISENSORY POWER-FUNCTIONS OF ELECTRONICALLY AVERAGED SLOW EVOKED CORTICAL RESPONSES IN MAN.
Nolf D. Ueidel and M. Spreng (Erlangen-Nurnberg U., Physiol. Inst., West Germany).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 201-210.
7 refs.

It is possible to record extracranially a characteristic slowly evoked cortical response of a rather complex nature. All potentials were evoked by sinusoidal tones of 1-second duration. They were averaged by means of a special type of physiological computer. It was possible to record clearly intensity-related human cortical responses of medium latency (second negative deflection, latency 150 to 180 msec.). Thus a quantitatively reliable correlation with the stimulus parameters was obtained. The late second negative deflection was measured and the results were compared with those of the Stevens group. This part of our cortical responses when plotted double-logarithmically versus intensity clearly showed the identical exponents of Stevens' power functions when stimulating the auditory and the somesthetic system, the latter especially by both vibratory and electric pain eliciting qualities. This correlation between electrophysiological and psychological sets of data clearly shows that the same correspondent steepness of intensity functions for different qualities and modalities of stimuli.

A65-82137
CENTRAL REGULATION OF THE VESTIBULAR SYSTEM.
J. J. Groen (Utrecht State U., O. R. L. Dept., The Netherlands).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 211-218.

Stimulation of the vestibular organs generates in a limited range stimulation-proportional activity, which is modified under influence of the central nervous system by two mechanisms: (1) inhibition, (2) pattern center interference. Inhibition appears to be a postnatal, acquired property as is shown by a series of measurements of eye deviations in newborn dogs and infants. Pattern center activity presumably originates during the same period preceded by development of nystagmus.

A65-82138
PHYSIOLOGICAL INTERPRETATION OF THE ANATOMY OF THE LABYRINTH.
S. H. Mygind.
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 264-273.

The structure of the labyrinth demonstrates that the stimulus is a perpendicular pressure and traction on the cuticular membranes, leading, not to a deformation, but to a dislocation between hair cell and its supporting cell, both in the acoustic and in the vestibular part. The mechanism of labyrinthine function is to a great extent in harmony with that of the other senses of orientation and regulations of position.

A65-82139
CENTRAL AND PERIPHERAL NYSTAGMUS. COMPARATIVE ELECTRONYSTAGMOGRAPHIC STUDY OF RESPONSES TO EXPERIMENTAL STIMULATION OF NYSTAGMOGENIC CENTERS AND PRE- AND POST GYRATORY REACTIONS IN THE RABBIT NYSTAGMUS CENTRAL ET NYSTAGMUS PERIPHERIQUE. ETUDE ELECTRO-NYSTAGMOGRAPHIQUE COMPARATIVE DES RESPONSES AUX STIMULATIONS EXPERIMENTALES DES CENTRES NYSTAGMOGENES ET DES REACTIONS GIRATOIRES PER- ET POST-ROTATOIRES CHEZ L'ANIMAL (PALIN).
A. Montandon, P. Montandon, G. Kaphan, and J. Libois (Geneva U., Clin. Oto-rhino-laryngol., Switzerland).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 320-328.
7 refs. In French.

The present experimental researches illustrate the parallelism between nystagmic responses from electrical stimulation of diencephalic centers and from rotatory stimulation of vestibular receptors. This concerns: (1) the latency which is of many seconds; (2) the apparition of a nystagmic reaction with regular rhythm, diphasic and horizontal jerks, beating in a unique and definite direction to the right or to the left; (3) the existence of the same reactional threshold, which is a frequency threshold; (4) a rapid increase of the nystagmic frequency during the initial period of stimulation; (5) the establishment of a stable maxima frequency whose level (in Hz) increases with the intensity of the stimulation (in ^{o}/sec.^{2} or in volts); and (6) the extinction of the reaction in the long standing stimulation (80 sec. and above) and inversely the increase in the duration of the response with the apparition of nystagmic post-discharges when the stimulus intensity, either electrical or rotatory, is increased.

A65-82140
VESTIBULAR EFFERENT SYSTEM: ELECTROPHYSIOLOGICAL RESEARCH.
O. Sala (Padua U., Ear, Nose and Throat Dept., Italy).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 329-337.
44 refs.

Experimental studies were performed attempting the direct demonstration of the function of the vestibular efferent system. During electric square-wave stimulation at tetanic frequency of the vestibular efferent system, both a reduction of the activity of the vestibular nerve and a modification of vestibular DC potentials were recorded. Stimulation with single impulses caused a discharge at the level of the contralateral vestibular nerve.

A65-82141
MODIFICATIONS OF THE ACTIVITY OF THE VESTIBULAR NUCLEI IN THE CAT, FOLLOWING STIMULATION OF THE TEMPORAL LOBE.
M. Arslan and G. A. Molinari (Padua U., Ear, Nose, and Throat Dept., Italy).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 338-344.
21 refs.

The behavior of various elements of Deiters' nucleus to the stimulation of the cerebral cortex of cats was investigated. Stimulation of the cortical areas was carried out by placing on the surface the positive pole of a galvanic circuit in which the intensity of the current could be varied manually. The same method was employed to stimulate the labyrinth by introducing electrodes into the animal's bullae previously opened through the submandible. Some vestibular neurons were inhibited by the cortical stimulattion and took up their primitive activity of discharge again when the stimulation ceased, either immediately or after a short rebound period in which the frequency was greater than the initial frequency. Various units of Deiters' nucleus that responded to the cortical stimulation were not influenced by the labyrinthine stimulation. It is concluded that modifications of the labyrinthine reflectivity due to experimental and pathological lesions of the supernuclear structures are determined not only by an action on the ocular motorneurons and on the reticular substance, but also by a direct action on the vestibular nuclei themselves.

A65-82142
THE STAPEDIUS REFLEX TO TONE STIMULI OF MEDIUM LOUDNESS IN ALERT RABBIT [DER STAPEDIUSREFLEX DES WACHEN KANINCHENS AUF TONREIZE MITTLERER LAUTSTARKE].
M. E. Wigand (Würzburg U.-Hals-Nasen-Ohren-Klin., West Germany).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 361-367.
16 refs. In German.

Awake rabbits with high spinal section show middle ear muscle activity on low sound levels. Latency, firing rate, and fatigue of motor units are influenced by the stimulating tone frequency. The results of electrical stimulation of the stapedial nerve argue against the existence of proprioceptors in the stapedial muscle. The effect of middle ear muscle reflex on damping of oscillations, picked up at the round window, is demonstrated. It seems to be more important for the temporal reduction of transient oscillations than for decreasing their amplitudes.

A65-82143
RESONANCE FREQUENCIES OF THE SKULL AND THEIR AUDIOMETRIC EFFECTS [DIE EIGENFREQUENZEN DES SCHADELS UND IHRE AUDIOMETRISCHEN AUSWIRKUNGEN].
H.-J. Borucki (Würzburg Universitätsklin. Für Hals-Nasen-Ohren-Kranke, West Germany).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 401-407.
14 refs.

Main resonance frequencies of the human skull cover the range from 1200 c.p.s. to 4000 c.p.s., therefore bone conducted white noise shows a marked improvement in this region. That could be verified by the pronounced masking effect of such a noise on air-conducted tones in that frequency range. A strong air borne white noise causes also vibrations of the skull, i.e., bone conducted sound, especially in the range of the main resonance frequencies of the skull. This may be the reason why normal ear protectors cannot always prevent inner ear damage.

A65-82144
ALTITUDE AND ATHLETIC PERFORMANCE.
L. G. C. E. Pugh (Med. Res. Council Labs., Natl. Inst. for Med. Res., Div. of Human Physiol., London, Great Britain).
Nature, vol. 207, Sep. 25, 1965, p. 1397-1398.

The decision to hold the 1968 Olympic Games in Mexico City at an altitude of 7,500 ft. above sea level has aroused interest in the effects of altitude on athletic performance. The performances of runners in the 1955 Pan American Games in Mexico City were compared with those of runners in the 1956 Olympic Games held in Melbourne. The times for the first three competitors in the finals of each event were averaged, and the differences between the altitude and the sea-level results were plotted against distance on a one-way logarithmic scale. The results reveal a linear relation between decrement in performance at altitude and log distance. Time increases ranged from 2.6% over 800 m. to 14.9% in the 10,000 m. event. Times at altitude were better than at sea level over 100 m. and 400 m., but not over 200 m. It was predicted that increase in time taken for a race lasting 6 min. would be about 8%. The results in this study are in accord with the predicted value.

A65-82127
VESTIBULO-OCULAR DISORGANIZATION IN THE AERODYNAMIC SPIN.
G. Melvill Jones (Roy. AF, Inst. of Aviation Med., Med. Res. Council, Farnborough, Great Britain).
(Intern. Congr. of Aviation and Space Med., 13th, Dublin, Ireland, Sep. 18, 1964).
Aerospace Medicine, vol. 36, Oct. 1965, p. 976-983. 15 refs.

On theoretical grounds it is to be expected that disturbance of vestibular and visual perceptual mechanisms could contribute substantially to the difficulties of recovery from an aerodynamic spin. To investigate this possibility experiments were performed in which simultaneous measurements were made of aircraft and compensatory eye angular velocities in the three planes of yaw, roll and pitch. The results showed that the greatest penalty is associated with the roll plane of the skull in which there is apparently very limited capability of optokinetic following. Consequently the misleading vestibular signals which arise from continued rotation drive an inappropriate oculomotor response which goes on virtually unchallenged by visual fixation in this plane. Failure to fixate can even occur in the yaw plane when the discrepancy between vestibular and optokinetic drives to the oculomotor system becomes sufficiently large. The practical implications of these and other features are discussed in the context of erect and inverted spin configurations and a number of specific recommendations are made.

A65-82128
RELATIONSHIP BETWEEN PAST HISTORY OF MOTION SICKNESS AND ATTRITION FROM FLIGHT TRAINING.
Charles W. Hutchins, Jr. and Robert S. Kennedy (U.S. Naval School of Aviation Med., Pensacola, Fla.)
(Aerospace Med. Assoc. Meeting, New York City, Apr. 27, 1965).
Aerospace Medicine, vol. 36, Oct. 1965, p. 984-987. 8 refs.

The Pensacola Motion Sickness Questionnaire (MSQ) was subjected to an item analysis using successful completion of the flight training program as the criterion for item selection. The resulting total score was found to be significantly correlated to completion of flight training. The scoring procedure was cross-validated and the significance of this relationship was verified. When included in the multiple prediction formulae used at this facility to predict training success, the MSQ made significant increases in the multiple validity of the formulae for predicting both successful completion of flight training and voluntary withdrawal from training.

A65-82129
THE MECHANISM OF BONE CONDUCTION: AN EXPERIMENTAL STUDY.
W. F. B. Brinkman, E. H. A. M. Marres, and J. Tolk (Nijmegen U., Dept. of Oto-Rhino-Laryngol., The Netherlands).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 109-115. 5 refs.

In 58 cats, measurements were carried out to study the relationship and importance of the external auditory canal, the middle and inner ear constructions in connection with bone conduction. Eight separate experiments with differing conditions of the hearing canal were carried out. These conditions included a stiffened tympanum, a fixed stapes and a closed auditory canal, and a separated incus-stapes connection. Recordings of microphonic potentials were made from the round window. It was found that the inertia of the ossicular chain as well as that of the inner ear fluid are by far the most important components causing bone conduction and that the mobile system of the ear must be considered to consist of at least two loosely coupled units of vibration.

A65-82130
DIFFERENCES IN METABOLISM OF INDIVIDUAL TURNS OF THE COCHLEA [UNTERSCHIEDE IM METABOLISMUS DER EINZELNEN SCHNECKENWINDUNGEN].
A. Meyer zum Gottesberge, S. Rauch, and E. Koburg.
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 116-123. 8 refs. In German.
Deutsche Forschungsgemeinschaft supported research.

In anatomical, biochemical and functional respects there are distinct quantitative differences from one cochlear turn to another. In the anesthetized guinea pig the DC potentials of Reissner's membrane and the oxygen consumption of the vascular stria decrease from the basal to the apical turn. In the same way the size and the rate of protein metabolism of the spiral ganglionic cells decrease. On the other hand, the permeability of Reissner's membrane increases from the basal to the apical turn. The various results are synoptically reviewed.

A65-82131
THE SIGNIFICANCE OF THE OLIVO-COCHLEAR BUNDLE FOR THE ADAPTATION MECHANISM OF THE INNER EAR.
C. C. Leibbrandt (Utrecht, State U., Lab. of Physiol., The Netherlands).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 124-132. 17 refs.

Cochlear adaptation was registered by recording the whole-nerve responses of the auditory nerve in the guinea pig to series of tone bursts (60 db). Decrease of amplitude of the action potential peak (N_1), observed in the course of these series, was abolished by injecting procaine into the internal auditory meatus, thus demonstrating efferent reflex-arc activity, normally producing cochlear adaptations.

A65-82132
THE ENDOLYMPHATIC AND PERILYMPHATIC AQUEDUCTS OF THE HUMAN EAR.
Barry J. Anson (Iowa State U., Coll. of Med., Dept. of Otolaryngol. and Maxillofacial Surg., Iowa City).
(Collegium Oto-Rhino-Laryngol. Amicitiae Sacrum, Meeting, Würzburg, 1964).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 140-153.
Am. Otol. Soc. supported research and Grant NIH NB-03855-02.

The fetal development of both the vestibular and cochlear aqueducts is described in otological series beginning with the 4-month stage. Postnatal progress and mature structure is traced from the newborn infant to the adult of 70 years (in dissections, serial sections and reconstructions prepared from the latter). These features are emphasized: histology of the osseous wall and the contained connective tissue; source and course of blood vessels derived from labyrinthine periotic tissue internally and meningeal layers externally; and normal range in adult anatomy. On these structural bases, the two channels are compared with special reference to their present and prospective role in otological surgery. Both aqueducts open internally on the wall of the osseous labyrinth and terminate in openings to the meninges. It is probable that both aqueducts function in maintaining a stage of balance in the fluid system of the inner ear.

A65-82133
THE SIGNIFICANCE OF BINAURAL HEARING FOR SPEECH DISCRIMINATION IN NOISE [DIE BEDEUTUNG DES BINAURALEN HORENS FUR DIE SPRACHLICHE VERSTANDIGUNG UNTER LARMEINWIRKUNG].
Harald Feldman (Heidelberg U.-Hals-Nasen-Ohren-Klin., West Germany).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 133-139. In German.

Psychoacoustic experiments have shown that the effective signal-to-noise ratio is considerably raised by binaural hearing if certain parameters (intensity, time-delay) of both components differ in both ears. The effect of these factors is examined (influence of frequency, coherence, etc.) and the results are discussed in view of the central nervous mechanisms evaluation of binaural information.

A65-82134
SLOW CORTICAL RESPONSES EVOKED BY ACOUSTIC STIMULI.
Hallowell Davis (Central Inst. for the Deaf, St. Louis, Mo.)
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 179-185. 5 refs.
Grant PHS B-3856.

Evoked responses of the waking human brain to acoustic stimuli can easily be recorded from external electrodes by means of an average response computer. The clearest responses are anatomically diffuse, long in latency, and are evoked by visual or tactile as well as auditory stimuli. Their amplitude varies quite widely across subjects, with the state of the subject, with the interval between stimuli (up to 10 seconds), and from one individual stimulus to the next. The average of a set of successive responses is sufficiently related to the intensity of the stimulus, however, to make the method useful for "objective" audiometry on a purely empirical basis, even though the response does not arise from the primary auditory cortical area. The thresholds of detection of the average evoked responses of severely hard-of-hearing children were compared with the children's subjective thresholds for the same filtered clicks. The mean difference was only 2.5 dB. The averages for five frequencies diverged by 18 dB or more in only two cases. The relation to their pure-tone thresholds was almost equally close.

A65-82135
STIMULUS CODING IN THE AUDITORY NERVE AND COCHLEAR NUCLEUS.
Nelson Yuan-sheng Kiang (Mass. Inst. of Technol., Res. Lab. of Electron., Cambridge; and Mass. Eye and Ear Infirmary, Eaton Peabody Lab. of Auditory Physiol., Boston).
Acta Oto-Laryngologica, vol. 59, Feb.-Mar.-Apr. 1965, p. 186-200 21 refs.
NASA Grant NsG-496; Grants PHS MH-04737-04 and NB-01344 and NSF GP-2495; and Contract DA-36-039-AMC-03200(E).

The average time pattern of response of any auditory nerve fiber to simple acoustic stimuli is predictable from its "tuning curve" and rate of spontaneous discharge. In contrast, units in the cochlear nucleus may exhibit radically different patterns of response to the same stimulus though their tuning curves and rates of spontaneous discharge are virtually identical. Messages carried by the auditory nerve are apparently recoded in the cochlear nucleus in a number of different ways. Consequently the nucleus should not be considered merely as a relay station.

A65-82145
EFFECT OF ACCELERATION ON THE DISTRIBUTION OF PULMONARY BLOOD FLOW.
A. C. Bryan, W. D. MacNamara, J. Simpson, and H. N. Wagner (Roy. Can. AF Inst. of Aviation Med.; and Princess Margaret Hosp., Toronto, Ontario, Canada; and Johns Hopkins Hosp., Baltimore Md.).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1129–1132. 15 refs.

The distribution of pulmonary blood flow was measured during increased positive (+ g_z) acceleration. Macroaggregated albumin labeled with iodine 131 was injected intravenously during centrifugal acceleration, by the method described by Wagner and co-workers. The particles embolize the pulmonary vascular bed in proportion to flow and can be subsequently detected by scintillation scanning of the lung. One study was done in one subject in one of the five following conditions: supine, seated, + $2g_z$, + $3g_z$, and + $4g_z$. The results show a progressively smaller reduction in upper zone perfusion with increasing acceleration agreeing with hydrostatic principles. Flow increased in the base up to + $2g_z$ but thereafter becomes fixed, suggesting that the vessels were then maximally dilated. The gas exchange consequences of these changes of perfusion are discussed indicating that there must also be ventilatory changes.

A65-82146
PRECOOLING OF PERIPHERAL ARTERIAL BLOOD IN COLD-ADAPTED AND WARM-ADAPTED RABBITS.
Nishio Honda (Ky. U., Dept. of Physiol. and Biophys. Lexington).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1133–1135. 6 refs.
Contract AF 41(657)-335.

The role of precooling of peripheral arterial blood in temperature regulation has been studied in cold-adapted and warm-adapted rabbits. It was found that precooling of arterial blood during its flow from the interior to the surface (ear) of the body in a cold environment is more marked in the cold-adapted rabbits. In a warm environment no difference was found between the two groups.

A65-82147
A CRITIQUE: RELATIONSHIP OF THE TIME DERIVATIVE OF PRESSURE TO BLOOD FLOW.
Jospeh C. Greenfield, Jr. and Donald L. Fry (Natl. Inst. of Health, Natl Heart Inst., Cardiol. Branch, Sect. of Clin. Biophys., Bethesda, Md.).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1141–1147. 15 refs.

The relationship of the time derivative of pressure to instantaneous aortic blood flow was studied in six dogs. Pressure was measured with calibrated high-fidelity manometry and flow with an electromagnetic flowmeter. The true time constants of the equation of fluid motion (relating blood flow to the pressure gradient) were calculated and compared to the magnitude of time constants necessary to produce flow contours computed from the pressure time derivative that empirically "matched" flows measured by the electromagnetic flowmeter. It was found that time constants which produced acceptable "matching" were approximately 20 times too large. This observation demonstrated that (1) the time derivative of pressure is not proportional to the pressure gradient and (2) the similarity of measured and computed flows, using the pressure derivative, depends not on the laws of fluid motion but rather on the accidental similarity of the final form of the equation of fluid motion (with pressure derivative substituted for pressure gradient) to an empirical equation describing the hydraulic input impedance to the aorta.

A65-82148
CIRCULATORY AND RESPIRATORY EFFECTS OF WHOLE-BODY VIBRATION IN ANESTHETIZED DOGS.
William B. Hood, Jr. and Lawrence S. Higgins (Aerospace Med. Div., Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1157–1162. 27 refs.
Contract AF 33(657)-9537.

Effects of whole-body axis sinusoidal vibration were studied in 27 anesthetized dogs. At a vibratory frequency of 10 cycles/sec. and at levels of peak acceleration greater than 0.3 g, increases in the accelerative force of vibration were accompanied by increases in mean arterial blood pressure, heart rate, cardiac output, oxygen consumption, central blood volume, and minute volume of ventilation. Peripheral vascular resistance decreased under the same conditions. At 6 cycles/sec. similar results were obtained, the only significant differences being in blood pressure and heart rate response. In three animals curare partially blocked the increase in oxygen consumption during vibration. Reserpine had no effect in two other animals. These studies suggest that the circulatory responses observed during whole-body vibration are due to muscular exercise.

A65-82149
EFFECT OF ACCELERATIVE FORCES ON AVIAN EMBRYOGENESIS.
E. L. Besch, A. H. Smith, and S. Goren (Calif. U., Dept. of Animal Physiol., Davis; and Headquart. Pacific Missile Range, Bioastronautics Office, Point Mugu, Calif.).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1232–1240. 15 refs.
ONR supported research.
NASA Contract R-53.

Fertile avian eggs from the domestic fowl and the Japanese quail showed a measurable loss of weight and a reduction in hatchability when exposed to varying intensities of centrifugal force for 10 min. Both of these effects are proportional to the intensity of the applied force. Coturnix (Japanese quail) chicks hatched from eggs exposed to centrifugal forces prior to incubation displayed no growth rate differences from those chicks from control eggs. Impact force necessary to cause failure of embryo developments is in excess of shell failure stress. The effect of subacute acceleration and impact deceleration is not manifested in the same manner in embryonated as in fertile eggs.

A65-82150
VERTICAL GRADIENT OF PERFUSION IN THE ERECT HUMAN LUNG.
K. T. Fowler (Sydney U., Dept. of Med., Biophys. Lab., Australia).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1163–1172. 35 refs.

A quantitation examination is made of a number of mechanisms which might contribute to the gross nonuniformity of blood flow observed in the erect lung. Passive distension of the small vessels by the increased transmural pressures in the base of the lung is shown to be an insufficient explanation of their heightened blood flow. A vertical assemblage of vascular units operating under "waterfall" conditions shows a rapid change of flow per unit with height. These conditions may be caused to apply over a range of heights near the center of the lung by the assumption of critical closing pressures in the capillary bed. If these pressures are allowed to have a range of values in accordance with the anatomical range of capillary diameters the height-flow relationship is brought close to that observed. The expected behavior of a model of this type is discussed.

A65-82151
PULMONARY COMPLIANCE AND NONELASTIC RESISTANCE DURING TREADMILL EXERCISE.
S. T. Chiang, Neal H. Steigbigel, and Harold A. Lyons (N. Y. State U., Downstate Med. Center, Dept. of Med., Pulmonary Lab., Brooklyn).
(Am. Physiol. Soc., 16th Fall Meeting Providence, R. I., Sep. 7–11, 1964).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1194–1198. 19 refs.
Grant PHS HE 5485.

Transpulmonary pressure, respiratory flow, and tidal volume of seven normal subjects were measured at rest and during treadmill exercise on the level at a speed of 1.5 m.p.h. Pulmonary compliance remained unchanged during exercise. Nonelastic resistance showed an insignificant increase (0.9-1.4 cm. H_20 per liter per sec.). Examination of other parameters which may affect compliance were made. Functional residual capacity decreased 120–200 ml. during exercise, tidal volume doubled, and respiratory frequency increased 43.5%, yet none of these factors affected the lung compliance. The phenomenon of "second wind" was experienced by four of the subjects, and nothing was observed to explain its occurrence during exercise.

A65-82152
PULMONARY DIFFUSING CAPACITY AND CAPILLARY BLOOD FLOW DURING FORWARD ACCELERATION.
Gordon G. Power, Jr., Richard W. Hyde, Raymond J. Sever, Frederic G. Hoppin, Jr., and Jean R. Nairn (Pa. U., School of Med., Graduate Div., Dept. of Physiol., Philadelphia; and U.S. Naval Air Develop. Center, Aviation Med. Acceleration Lab., Johnsville, Pa.).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1199–1204. 22 refs.
Bur. of Weapons supported research.
Grant NIH H-5430.

Possible cause of the decreased arterial oxygen saturation seen when a subject is accelerated in a centrifuge were studied by measuring simultaneously the pulmonary diffusing capacity for CO (D_{LCO}), and the effective pulmonary capillary blood flow (Qc), using breath-holding techniques with carbon monoxide and acetylene. After 1 min. of forward ("eyeballs in") acceleration at eight times normal gravity, 8g, average D_L decreased 35% from an initial control of 33.7 to 21.5 ml./(min. x mm. Hg) in four subjects. Although this decrease was statistically significant, the values observed were not low enough to indicate that impaired diffusion was a prime cause of arterial unsaturation. Average Qc decreased 35% during acceleration from an initial control value of 12.9 to 8.2 liters/min., also a significant change. These values may have indicated that total pulmonary blood flow was reduced; but a more likely explanation is that a large portion of pulmonary flow perfused nonventilated regions. D_L and Qc returned toward initial control levels within 8 min. after acceleration in most instances.

A65-82153
EFFECTS OF FORWARD ACCELERATION ON ANATOMICAL DEAD SPACE.
Charles Jacquemin, Jean Demange, Jean Timbal, and Pierre Varene (Centre d'Essais en vol, Lab de Med. Aerospatiale, Bretigny-Sur-Orge, Seine et Oise, France).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1205-1210. 30 refs.

The effects of transverse acceleration (1-5 g) on anatomical dead space have been studied on four human subjects. Instantaneous analysis of expired gases has been done by mass spectrometer. Half deflection between inspired gases and alveolar plateau levels is considered as the signal for the end of dead-space sweep. It is confirmed that no obstructive syndrome occurs during these accelerations. The airway size is not reduced; on the contrary, the anatomical dead space increases with the level of accelerations. Furthermore, a decreasing slope of the CO_2 alveolar plateau has been noted on two subjects. These facts can be interpreted admitting a passive displacement of the pulmonary blood mass under influence of forward acceleration and the adjustment of ventilation to perfusion.

A65-82154
REACTION OF THE CHICK TO ONE ATMOSPHERE OF OXYGEN.
Harold S. Weiss, Ronald A. Wright, and Edwin P. Hiatt (Ohio State U., Coll. of Med., Dept. of Physiol., Environ. Physiol. Lab., Columbus).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1227-1231. 20 refs.
NASA GRANT NsG-295-62.

The white Leghorn chick between the ages of 2 and 7 weeks is markedly resistant to the toxic effects of 1 atm. O_2. Continuous exposure for as long as 4 weeks caused neither deaths, obvious morbidity, nor signs of pulmonary damage on gross autopsy. Nevertheless the hyperoxia had some adverse effects, primarily reducing the growth rate to 75-25% of normal, reducing feed intake per unit body weight to 75% of normal, slowing respiratory rate by 31%, decreasing erythrocytes, hemoglobin, and hematocrit by 9-12%, and causing some reversible histological changes in the lungs. Arterial O_2 tensions were elevated over 3mm. Hg, but arterial Pco_2 and blood pH were unaffected. No residual effects were noted upon return to air breathing. The anatomical peculiarities of the avain lung may play some role in the chicks resistance to hyperoxia, but it is also possible that it is a function of age similar to the tolerance shown by the young rat but not the adult.

A65-82155
MORPHOLOGICAL CHANGES IN AVIAN EGGS SUBJECTED TO ACCELERATIVE FORCE.
E. L. Besch, A. H. Smith, and M. W. Walker (Calif. U., Dept. of Animal Physiol., Davis; and U. S. Naval Missile Center, Environ. Lab., Point Mugu, Calif.).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1241-1248. 12 refs.
NASA Contract R-53.

Subacute accelerative forces cause a yolk particle displacement (apparent on the yolk surface) which erodes the blastoderm cells and results in reduced hatchability. The disturbance of the yolk substance is slowly induced, proportional to the force intensity, and its degree directly related to reduced hatchability. There is no apparent effect of the accelerative force on the vitelline membrane which surrounds the yolk. Impact deceleration does not cause an apparent morphological or biological change in the blastoderm.

A65-82156
CORTICAL CO_2 AND O_2 AT HIGH PRESSURES OF ARGON, NITROGEN, HELIUM, AND OXYGEN.
Peter B. Bennett (Roy. Naval Physiol. Lab., Alverstoke, Hants, Great Britain).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1249-1252. 25 refs.

In 37 chloralosed cats (45-50 mg./kg.) exposed to increased pressures of argon, nitrogen, or helium between 8.67 and 10.8 atm. abs. in the presence of either 0.2 or 2.34 atm. abs. oxygen or oxygen alone, the cortical carbon dioxide was measured with a modified Severinghaus electrode and the cortical oxygen polarographically. In mixtures with an oxygen partial pressure of 2.34 atm. abs., the cortical oxygen increased above controls. The greater the density of the mixture then, the less was the increase. The cortical carbon dioxide also increased, but conversely, the greater the density of the mixture the greater the increase in carbon dioxide. In mixtures of low oxygen partial pressures, the cortical oxygen was below control values whereas the carbon dioxide showed little change except for a slight increase with the heavier argon mixture. Inert gas narcosis, as indicated by depression of auditory induced cortical spikes, did not correlate with the changes in cortical carbon dioxide but with the inert gas itself. Increasing the oxygen partial pressure and the density of the mixture respired caused retention of brain carbon dioxide, which synergistically potentiated the narcosis.

A65-82157
ALTERED SURFACE TENSION OF LUNG EXTRACTS AND LUNG MECHANICS.
D. F. Tierney and R. P. Johnson (Calif. U., Cardiovascular Res. Inst.; San Francisco; San Francisco Med. Center, Calif.; and Direct. of Med. Res., Edgewood Arsenal, Md.).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1253-1260. 31 refs.
Grant PHS HE-06285.

Reduction of the surface area of 24 extracts of rabbit lungs by four-fifths decreased the surface tension to a minimum value of 0-5 dynes/cm. at 18-22°C. However, minimum surface tension was above 15 dynes/cm. if (1) the temperature was raised to 42°C., (2) the extract was prepared with distilled water, (3) phospholipase C was incubated with the extract, and (4) cholesterol or oleic acid was added to the surface. If blood or serum was added during the extraction, minimum surface tension was usually (although not invariably) elevated. Rinsing diluted rat serum or chylomicrons through the airways increases elastic recoil of excised rat lungs. Other reports show that heating a lung above 42°C. or rinsing a solution of phospholipase C through the airways also increases elastic recoil of excised rat lungs. Therefore, these conditions alter the surface tension of lung extracts and the pressure-volume characteristics of the lungs concordantly. In addition, it was found that the surface tension of lung extracts was not stable below 24 dynes/cm. Similar instability of the surface within the lung should lead to gradual atelectasis if a low transpulmonary pressure is maintained.

A65-82158
EFFECT OF IMMERSION ON INTRAPULMONARY PRESSURE.
A. S. Jarrett (Roy. AF. Inst. of Aviation Med., Farnborough, Hants, Great Britain).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1261-1266. 11 refs.

Pressure-volume relaxation curves have been determined for relaxed, breath-holding subjects lying and sitting in air and water. Immersion in water resulted in a marked increase in intrapulmonary pressure, the whole pressure-volume curve appearing to be shifted along the pressure axis. From the regression equations of the four curves the pressures at normal relaxed chest volume were calculated, and the center of pressure of the immersed chest shown to lie 19 cm. below and 7 cm. behind the sternal angle. The significance of this to the positioning of a diver's demand valve is discussed.

A65-82159
DEEP DIVING AND SHORT DECOMPRESSION BY BREATHING MIXED GASES.
H. Keller and A. A. Bühlmann (Zurich U., Dept. of Internal Med., Switzerland).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1267-1270.
Contracts ONR N 62558-3052 and N 62558-3093.

A series of test dives carried out by 14 subjects in depths between 130 and 1,000 ft. for periods varying between 5 min. and 2 hr. revealed that changes of inert gas in the breathing mixture (oxygen and nitrogen) permit a considerable shortening of the decompression time. The physical and physiological basis of the methods is discussed.

A65-82160
EFFECTS OF COOLING THE ARM AND HAND.
Jack H. Petajan and Jasper R. Daube (Wis. U., Med. Center, Depts. of Physiol. and Neurol., Madison).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1271-1274. 10 refs.
Grant PHS NB-04323.

This study undertakes to: (1) quantify the effects of immersion of the arm and hand in 10°C. water for 15 min. of the conduction velocity of the median nerve, the action potential of the thenar muscles, and rapid successive apposing movements (RSM) of the thumb; and (2) determine whether or not habituation by daily 15 min. cold exposure of the arm and hand for 5 weeks is reflected in any alteration of the aforementioned parameters. Ten young adult subjects were studied. All parameters of function were grossly impaired by the cooling. A roughly linear dependence upon thenar temperature was found for the latency of response and the duration of the negative spike of the action potential. RSM increased logarithmically with increasing thenar temperature. In two repeatedly exposed subjects, RSM improved slightly under all conditions which was felt due to learning. More frequent cycle vasodilatation and more rapid finger tip warming was observed. No significant difference in conduction velocity between control and habituated subjects was found.

A65-82161
CRITICAL TEMPERATURE FOR INSTRUMENTAL RESPONSE ACQUISITION IN HYPOTHERMIC RATS.
J. A. Panuska and V. P. Popovic (Emory U. Med. School, Dept. of Physiol. Atlanta, Ga.)
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1275-1277. 7 refs.
Grants Natl. Inst. of Gen. Med. Sci. GM-09652 and CA-06311.

Fifty-one previously untrained adult white rats were cooled to colonic temperature of 18.5°C. and were rewarmed to various body temperatures between 23 and 31°C. After their body temperature stabilized at a chosen level, rats were placed in a chamber with the possibility of using a lever-activated heat reinforcement apparatus. The temperature of the chamber was 2°C. Each experiment lasted 180 min. During this time the rats either started to press the lever steadily for external heat or at the end of this experiment they became even more hypothermic. In a group of 41 rats kept at a body temperature of 25°C. or above, 38 animals used the simple heat reinforcement apparatus and responded effectively, thus rewarming themselves to euthermia. Animals at a higher body temperature acquired the response earlier than animals whose body temperature was lower. When the body temperature was 25°C. or below, the rats failed to acquire the response. Thus it appears that body temperature of 25°C. is a critical body temperature for this simple response acquisition.

A65-82162
BODY TEMPERATURES IN SOME AUSTRALIAN MAMMALS. V. ABORIGINALS.
Peter Morrison (Alaska U., Inst. of Arctic Biol., Lab. of Zoophysiol., College).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1278–1282. 11 refs.
Grant NIH GM-10402.

Skin temperatures were measured on nine body areas with a portable radiometer at the beginning and at the end of a night of sleep in early summer. The subjects, young Australian aboriginal men and women from Haast's Bluff, slept in their normal circumstances outside on the ground with little protection. With some cover or on warmer, cloudy nights (average air temperature of 26.5°C.), there were no losses in temperature beyond the expected nocturnal decline. With minimal cover on clear, cool nights when temperatures ranged down to 19°C. for air and ground and to 4°C. for sky, substantial losses were found for the 6-hr. period: 33.2–30.4°C. for the forehead; 27.7–20.8 for the feet; 30.5–27.2 for the mean of the exposed skin; and 37.0–35.1 for the mouth. The maintenance of sleep at this level of cooling (minimum foot value = 17.6°C.) represents a valuable adaptation in these people. Tropical aboriginals from Mornington and Bentinck Islands did not exhibit this tolerance, and insisted on cover even on warm nights (air temperature of 27°C.) which did not depress skin temperature.

A65-82163
TEMPERATURE REGULATION IN YOUNG WOMEN.
Sister Wilma Marie Haslag and Alrick B. Hertzman (St. Louis U. School of Med., Dept. of Physiol., Mo.).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1283–1288. 18 refs.
Am. Phys. Therapy Assoc. supported research.
Grant Natl. Heart Inst. H-4939-03-04.

Possible sexual differences in the regulation against acceptable heat loads were studied by exposing female and male subjects to rising ambient temperature, T_A (1 hr. at 25°C., then 6.6°C. hr. to 45°C.) or to steady T_A (43.3°C. for 3 hr.). Women were studied during the menstrual, preovulatory, and postovulatory periods. Oral (T_O) and skin (T_S) temperatures, cutaneous opacity pulses, regional sweating rates, and weight losses were measured. During the menstrual and preovulatory periods, the thermoregulatory responses of women were similar to those of men except for slightly larger cutaneous opacity pulses and greater rates of weight loss in several of the male subjects. The T_O, but not T_S, was consistently higher in women during heat exposures in the postovulatory period. Of several possible explanations, a higher setting of the hypothalamic thermostat seems the more probable reason for the elevation of T_O without corresponding increase in weight loss, regional sweating, and cutaneous opacity pulses. In other respects there were no essential differences in temperature regulation attributable to sex.

A65-82164
EFFECT OF EXERCISE ON THE CEREBRAL CIRCULATION AND METABOLISM.
Eldred G. Zobl, Frederick N. Talmers, Raymond C. Christensen, and Lesem J. Baer (Veterans Admin. Hosp., Cardiac Res. Lab., Dearborn, Mich.; and Wayne State U. School of Med., Detroit, Mich.).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1289–1293. 37 refs.

Cerebral hemodynamics and metabolism were studied in 13 normal patients and 14 hypertensive patients at rest and during vigorous physical exercise. Cerebral blood flow was determined by the nitrous oxide method. The cerebral vascular resistance in normal and hypertensive patients remained remarkably constant during exercise despite a marked reduction in total peripheral resistance. Cerebral blood flow was relatively unaffected by the marked increase in cardiac output, and the cerebral metabolism did not share in the increased total body metabolism. During vigorous physical exercise the brain behaved as a steady-state organ.

A65-82165
RENAL CLEARANCES DURING PROLONGED SUPINE EXERCISE AT DIFFERENT LOADS.
Gunnar Grimby (Göteborg U., Dept. of Clin. Physiol., Sweden).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1294–1298. 17 refs.
Swedish Life Insurance Co. supported research.

Clearance of inulin (C_{IN}) and para-aminohippuric acid (C_{PAH}), cardiac output, oxygen uptake, and arterial blood pressure were measured in 15 healthy male subjects at rest and during supine exercise of 45 min. duration on a bicycle ergometer. Work loads between 150 and 900 k.p.m./min. were chosen. C_{PAH} decreased with increasing work intensity (heart rate). At an oxygen uptake corresponding to half of the aerobic work capacity it was about 70% and at heavy work 35–45% of the value at rest. The renal fraction of the cardiac output averaged, at rest, 17% and decreased with increasing work loads to 2.5–5% as a minimum. C_{In} did not change significantly until heavy exercise was performed. The filtration fraction increased during exercise.

A65-82166
EXCESS LACTATE CONCEPT AND OXYGEN DEBT OF EXERCISE.
Karlman Wasserman, George G. Burton, and Antonius L. Van Kessel (Stanford U. School of Med., Dept. of Med., Respirat. Function Lab., Palo Alto, Calif.).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1299–1306. 31 refs.
Grant PHS HE 06591.

The Huckabee concept that "excess lactate" (XL) is equivalent to the O_2 debt exercise and physiological phenomena derived therefrom, were investigated. Measurements of O_2 debt, arterial blood lactate and XL, and O_2 consumption were made during cycle ergometer exercise of controlled intensity and duration. Our results indicate: 1) The oxygen equivalents of XL as well as Δ lactate are less than the O_2 debt, at all work loads. 2) The concentration of XL does not linearly increase during exercise. 3) The anaerobic metabolic rate whether calculated from XL or O_2 debt is not a constant fraction of the metabolic rate, at all work loads. A larger fraction of energy is derived from the O_2 debt creditors at heavy and very heavy than at moderate work loads. 4) In 30 controlled work-load exercise studies of prolonged duration, XL did not contribute any information not revealed by lactate itself. 5) The differences between Huckabee's results and those of our own are due to differences in the measurement of XL but rather to differences in the directly measured O_2 debt.

A65-82167
EFFECT OF MUSCULAR EXERCISE IN A HOT ENVIRONMENT ON CANINE FIBRINOLYTIC ACTIVITY.
E. Bedrak (Negev Inst. for Arid Zone Res., Dept. of Environ. Med., Beersheva, Israel).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1307–1311. 17 refs.
Ford Found. and B. de Rothschild Found., Israel supported research.

The effect of muscular exercise, heat stress, and muscular exercise plus heat stress on the euglobulin fibrinolytic enzyme system was determined in 11 Alsatian dogs prior to and after acclimatization in a hot environment. All the physiological stresses employed particularly muscular exercise in a hot environment, enhanced the fibrinolytic activity and lowered plasma fibrinogen levels in all animals, especially in the nonacclimatized. The increased fibrinolytic activity, as measured by fibrin plate methods, was primarily related to plasminogen activator and to a lesser degree to active plasmin. In acclimatized animals at rest, the activity of plasminogen activator is lower, that of plasmin is relatively unchanged, while the level of plasma fibrinogen tends to be higher than in nonacclimatized animals at rest.

A65-82168
PLASMA CATECHOLAMINES AT HIGH ALTITUDES.
Federico Moncloa, Martá Gómez, and Alberto Hurtado (Univ. Peruana de Cienc. Méd. y Biol., Inst. de Invest. de la Altura, Lima, Peru).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1329–1331. 17 refs.
Grant NIH 08576.

High altitude native residents and newcomers to a low ambient pressure (36 hr. after arrival have normal plasma levels of adrenaline and noradrenaline in the fasting condition. Thirty minutes after the intravenous injection of insulin the high-altitude residents show increase of epinephrine greater than in men living at sea level. These results are interpreted as a consequence of the lower glucose values observed at high altitudes.

A65-82169
DISTRIBUTION OF INSPIRED GAS DURING VENTILATION WITHOUT RESPIRATORY MOVEMENTS.
Stefan J. A. Lichtneckert and Claes E. G. Lundgren (Lund. U., Inst. of Physiol., Lab. of Aviation Med., Sweden).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1350–1354. 15 refs.

Normal subjects were ventilated by means of a barospirator, which allows cyclical ventilation without respiratory movements. It was thus possible to eliminate the influence that distention may have and allow flow resistance in the airways and the volume of the air spaces ventilated through them to become the main factors defining the distribution of inspired gas. Distribution of inspired gas was measured by nitrogen-elimination technique and by calculation of the index of alveolar ventilation. It could be demonstrated that the distribution of inspired gas in ventilation without respiratory movements is uneven, which is ascribed to different relations between the above-mentioned resistance volume factors in different parts of the lungs.

A65-82170
GAS CHROMATOGRAPHY AND PULMONARY DIFFUSING CAPACITY MEASUREMENTS.
L. A. Danzer, K. L. Kearns, and J. E. Cohn (Ky. U., Med. Center, Dept. of Med., Lexington).
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1359–1361. 7 refs.
Grant NIH NB 03792.

A gas chromatographic system is described which accurately measures low levels of neon and carbon monoxide in high concentrations of oxygen. The system contains a special parallel column package used in conjunction with a venting valve. Accurate reproducible analyses for Ne, CO, CO_2 and N_2 are obtained from a single 10-ml. gas sample.

A65-82171
A SMALL, LIGHTWEIGHT PRECORDIAL COUNTER FOR DETERMINATION OF CARDIAC OUTPUT.
Ralph J. Gorten (Veterans Admin. Hosp., Radioisotope and Med. Serv.; and Duke U. Med. Center, Dept. of Med., Durham, N. C.)
Journal of Applied Physiology, vol. 20, Nov. 1965, p. 1365–1366. 9 refs.

A compact, lightweight scintillation detector which can be firmly attached to the anterior chest was fabricated in order to better adapt the isotope-precordial counting technic for measurements of cardiac output during exercise. In this manner useful indicator-dilution curves can be obtained without arterial puncture at light-to-heavy levels of bicycle ergometer or treadmill exercise. The use of a thin crystal and the omission of lead shielding and collimation of the detector is possible with a soft-energy gamma-emitting indicator of blood flow such as iodinated (I^{125}) albumin.

A65-82172
THE MECHANISM OF SECRETION AND ABSORPTION OF ENDOLYMPH IN THE VESTIBULAR APPARATUS.
G. F. Dohlman (Banting Inst., Toronto, Canada).
Acta Oto-Laryngologica, vol. 59, Feb.–Mar.–Apr. 1965, p. 275–288. 40 refs.
Grant NIH 04140-01; and Defence Med. Res. Labs., Canada supported research.

A light- and electronmicroscopic study of the specialized cells surrounding the haircell areas of the cristae ampullares and an electronmicroscopic study of the planum semilunatum cells, earlier shown to be secretory have been carried out. A viscous secretion produced in the haircell region probably by the supporting cells is indicated. This secretion seems to create the "subcupolar space". The cells on the slopes of the cristae are of two kinds: "dark", osmiophic cells and "light", osmiophobic cells. Experiments have indicated that the dark cells are absorbing cells and that the light cells probably are secretory. The dark cells have been shown to transport Na^+ ions, whereas the Cl^- ions pass in the intercellular spaces. It has been shown that the KCl of the endolymth can depolarize the nerve branches of the VIII nerve in the living animal producing nystagmus similar to a Ménière attack. A discussion follows.

A65-82173
TEAM-TRAINING EFFECTIVENESS UNDER VARIOUS CONDITIONS.
James C. Taylor and George E. Briggs (Ohio State U., Columbus).
Journal of Applied Psychology, vol. 49, Aug. 1965, p. 223–229. 22 refs.
Contract Navy N61449-1327.

Transfer performance of three-man teams was measured as a function of two system variables (task complexity and organization) and one training variable (skill level of a replacement for one of the team members) in a simulated radar controlled aerial intercept task. Each independent variable influenced team performance. Task complexity had a consistent effect across all transfer sessions with superior performance on the less complex task. Task organization influenced performance only after the replacement occurred with superior performance by teams organized to permit each subject to work independently of (rather than interact with) his counterpart. The teams receiving a more highly trained replacement improved in performance immediately following; teams with a less skilled replacement actually deteriorated slightly but then recovered in a subsequent work period.

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